Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

Chicago, January 21, 1928 (*Issued Every Other Week*) Volume XXXI, No. 2

MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

Printing of This Issue Is 5500 Copies. Next Issue Will Be February 4

BECAUSE boom can be raised or lowered at command of the control levers, and no adjustment of crowding cables is needed, the Koehring adapts itself instantly to new conditions and situations.

The pitch of the dipper is easily adjusted for ditching!

Bucket has no interfering bail, this construction making it possible to lift big boulders!

The Koehring dipper bites deep! Because there's full, undivided driving power behind it! Cuts out time-wasting nibbling!

Ready instantly for anything—high bank work, level shallow stripping, deep close-in digging, high dumping!

— the shovel of fingertip ease of control! — *of speed* in every function! Know the Koehring!

Shovel Capacities

Line-of-plate struck measure.
Quickly convertible to crane or dragline.

No. 301—19'-6" Boom. ⅝ Yd. Dipper on 19' Dipper Sticks; ¾ Yd. Dipper on 16' Dipper Sticks; 1 Yd. Dipper on 13' Dipper Sticks.

Shock absorber on boom. Wisconsin four cylinder gasoline engine, 5¼" x 6½", 1,000 R. P. M.

No. 501—24' Boom. 1 Yd. Dipper on 19' Dipper Sticks; 1¼ Yd. Dipper on 16' Dipper Sticks; 1½ Yd. Dipper on 13' Dipper Sticks.

Shock absorber on boom. Wisconsin four cylinder gasoline engine, 6" x 7", 925 R. P. M.

Write for Shovel Bulletin No. S-29

KOEHRING COMPANY MILWAUKEE WISCONSIN

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KOEHRING HEAVY DUTY

ROTEX

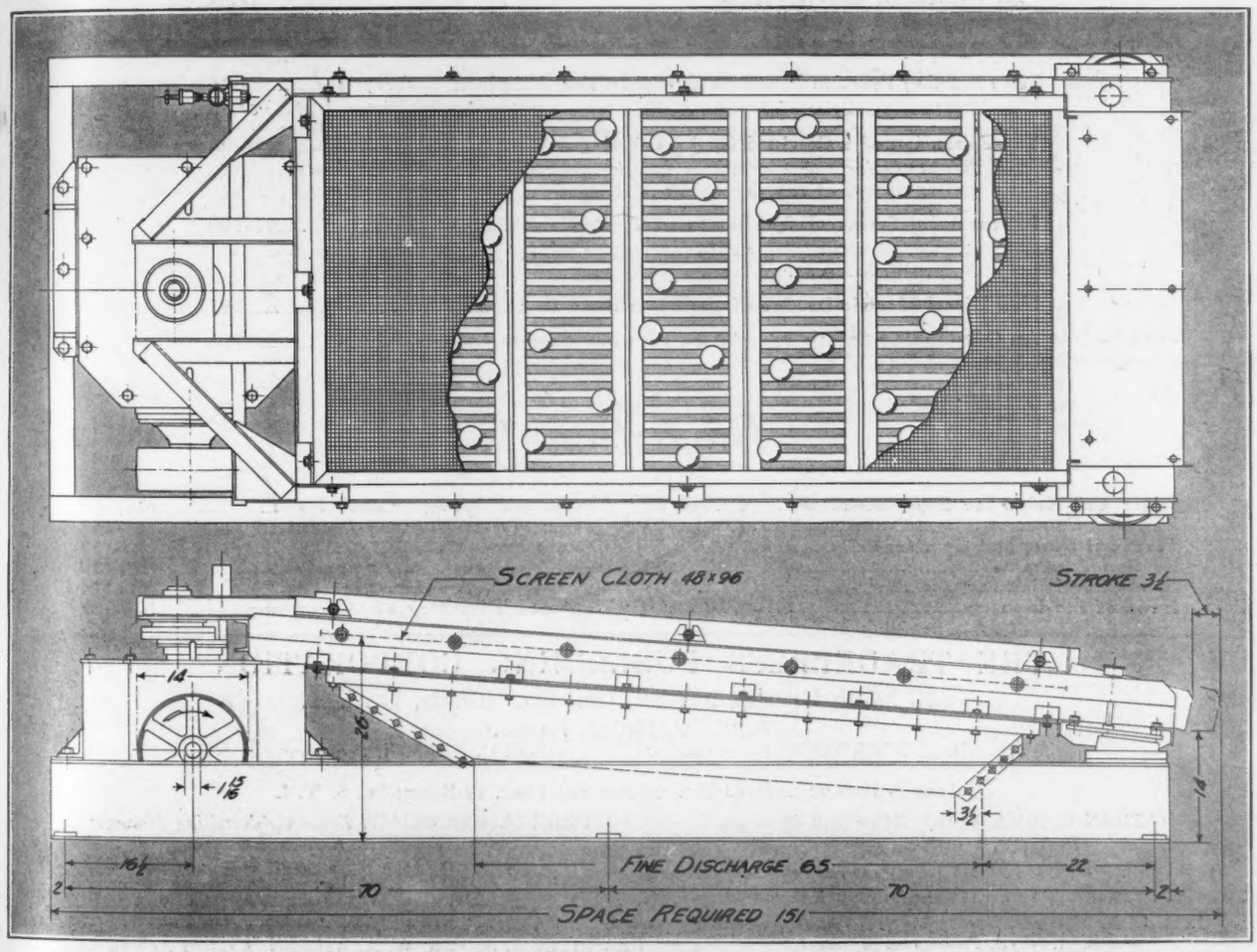
WHERE HEAD ROOM IS A FACTOR

The Rotex screen with its nearly level surface, usually "fits in," much better than other screens.

Below is a dimensional drawing of the Rotex Heavy Duty screen, No. 14. It has a good size screen cloth, 4 feet wide and 8 feet long, but measures only 26 inches from the base up to the head end of the screen surface. The overall height is but 34 inches.

Another advantage of the nearly level, gyrating, screen surface of the Rotex, is that the maximum amount of washing effect can be secured with a minimum amount of water. The material lays at a greater depth and scrubs itself as it travels along. However, washing is only one phase, and it must not be thought that the Rotex was designed only for washing. It shows up just as well when it comes to the making of accurate separations of dry materials.

Write for descriptive Catalog No. 81. It also contains net prices



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ORVILLE SIMPSON COMPANY
Office and Factory
1221 KNOWLTON ST. CINCINNATI. OHIO

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Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Entered as second-class matter, July 2, 1907, at the Chicago, Ill., postoffice under the Act of March 3, 1879.

Contents for January 21, 1928

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542 South Dearborn Street, Chicago, Illinois, U. S. A.

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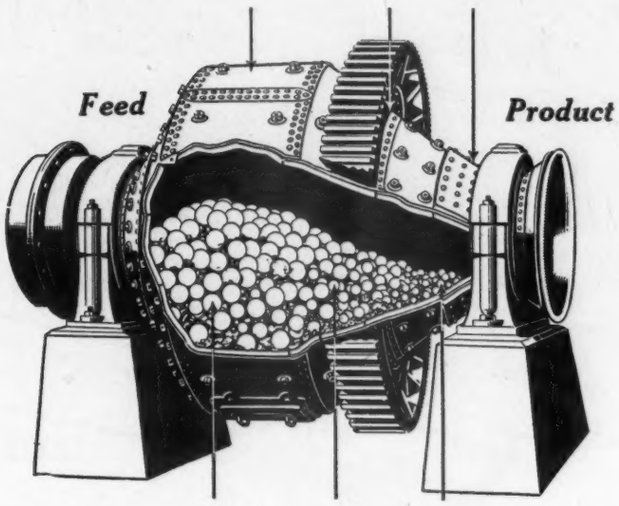
Comparative peripheral speeds	650 ft. per min.	400 ft. per min.	250 ft. per min.



Comparative relation of sizes of balls to material	5" ball crushing 2" material =15.6:1	3¼" ball crushing 1" material =43:1	2¼" ball crushing ½" material =125:1

THE Cone itself is a classifying agent.

Particles of different sizes revolved in the Conical Mill immediately classify themselves with the largest piece at the greatest diameter. You can prove this for yourself by writing for a glass model of the Hardinge Mill.

The natural classifying action of the Conical Mill increases production, improves the product, and decreases power. It is a positive aid to outside classifying devices when they are used.

Write for a glass model of the Conical Mill

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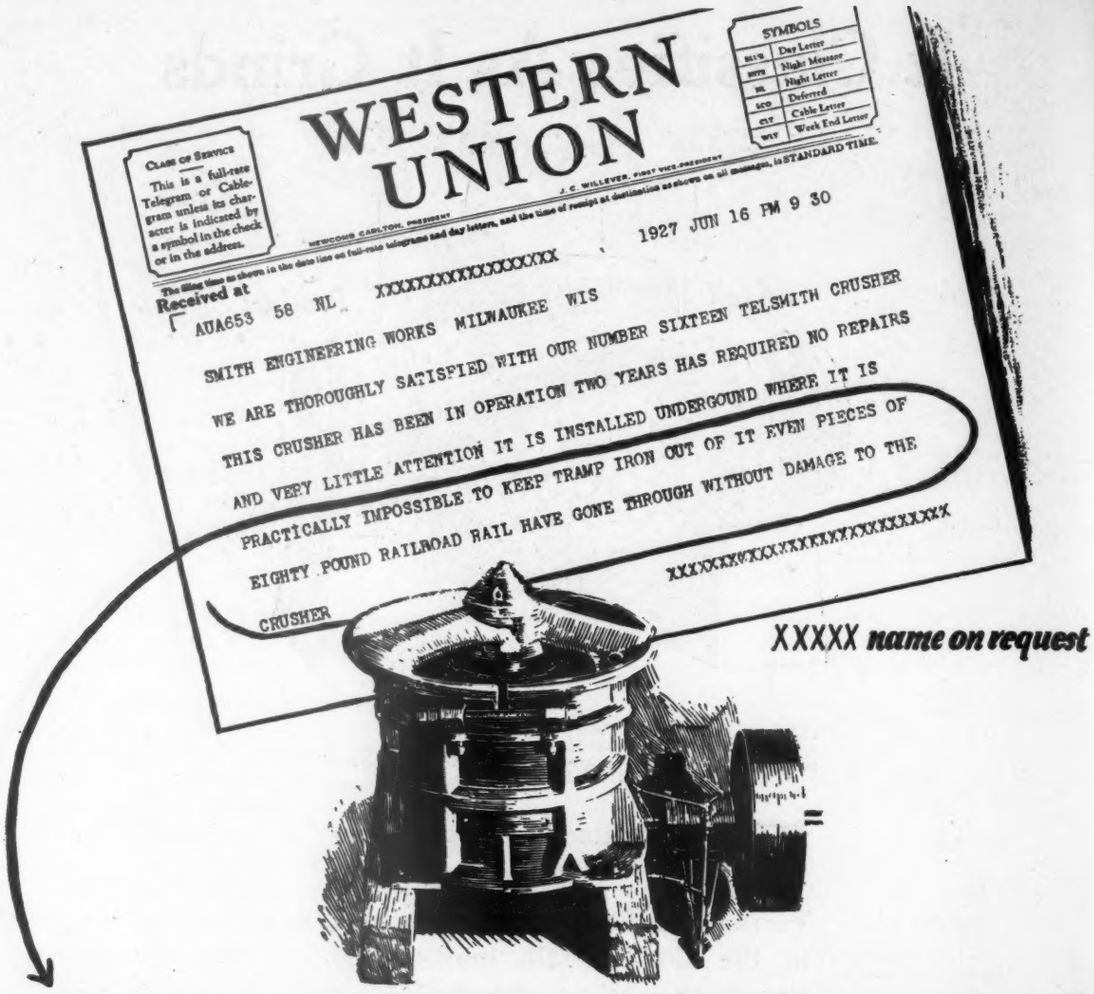

--"pieces of eighty pound railroad rail have gone through without damage to the crusher"

Here's a telegram from the superintendent of an iron mine in northern Michigan. It tells how Telsmith has made good under unusually severe conditions, where ordinary crushers would have failed. It tells a story of security—security against tramp iron and expensive shut-downs—a security that the miner, the quarry man and the gravel plant operator of today **demand.** Only Telsmith—the modern steel crusher—can give such security.

Short, stocky, compact—Telsmith's very design assures extraordinary strength. Steel is twice as strong as gray iron—and Telsmith's construction is 90% steel. First, there is its **steel frame,** sturdily walled and staunchly ribbed; second, its **steel crown,** low-arched, with huge arms and rim. Then, forming a rigid steel backbone for the entire crusher, comes its **unbreakable shaft.** No wonder Telsmith defies tramp iron.

Strongest of all is **Telsmith's Guarantee** of these three vital parts—frame, crown and shaft—for two years against breakage. Let us tell you all about it, as well as Telsmith's many performance superiorities, in Catalog 166 (Telsmith Primary Breaker) and Bulletin 2F11 (Telsmith Reduction Crusher). Write for them **now.**

Smith Engineering Works

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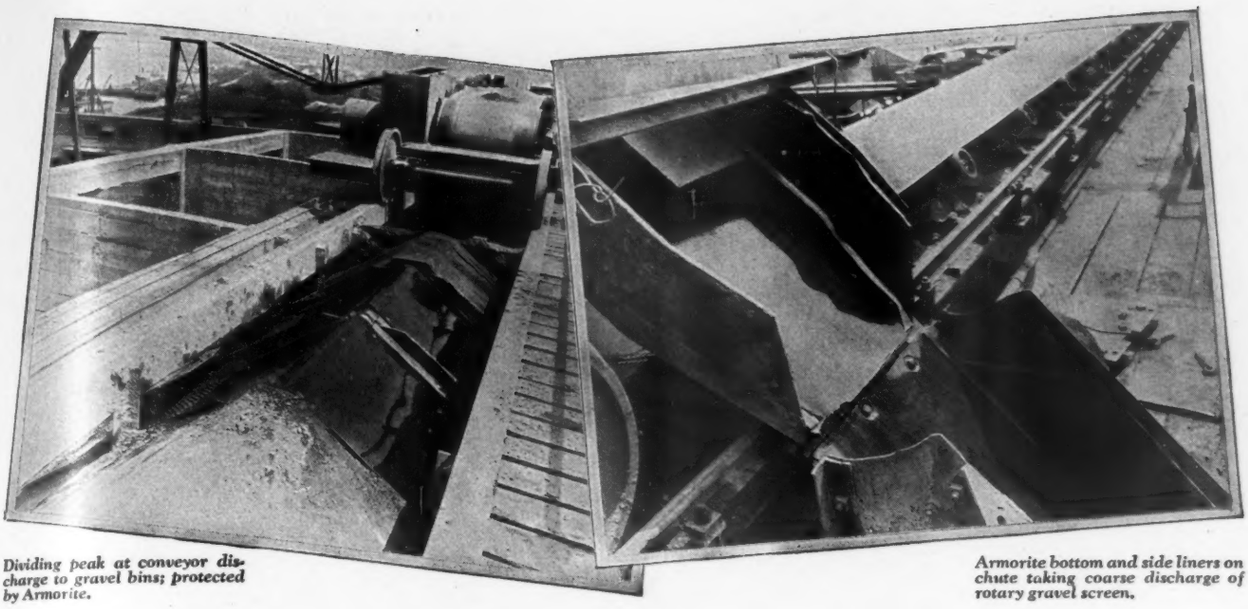
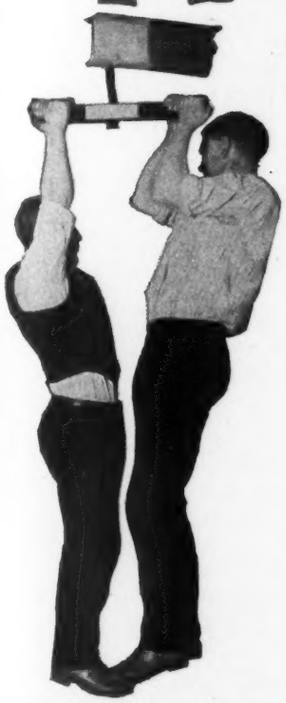


Dividing peak at conveyor discharge to gravel bins; protected by Armorite.

Armorite bottom and side liners on chute taking coarse discharge of rotary gravel screen.

Armorite Saves Money on Sand and Gravel Operations!



A test of Vulcalock adhesion. A strip of soft rubber one inch square was attached by a butt joint to a steel plate—the only connection between rubber and metal being one square inch of "Vulcalocked" surface. The joint easily supports the weight of two men.

WHEREVER any surface is exposed to severe abrasion—there is the place for Armorite! On hoppers, chutes, screens, baffle plates, screen peaks, etc., it quickly earns its cost.

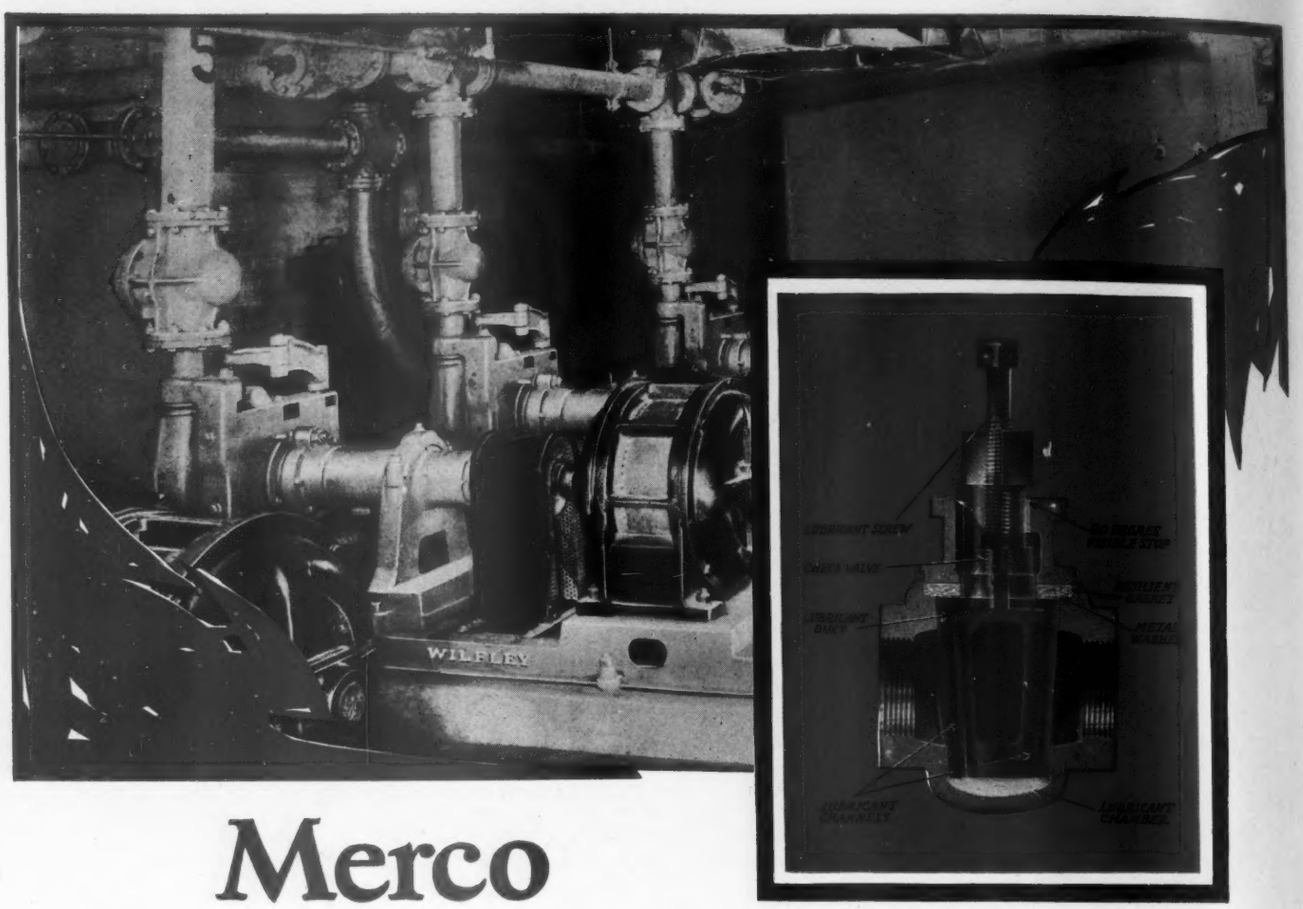
The superintendent of an Ohio river dredge reports that *one* sheet of Armorite has outworn *ten* ½" steel baffle plates, and has effected additional important savings in labor-cost and shut-downs.

Armorite is furnished on either steel or fabric base. With steel base, the rubber is attached to the metal by the Vulcalock process, giving a practically integral union which permits bending, cutting and drilling the sheet without injury. With fabric base, Armorite can be cut to any desired shape, and bolted, screwed, nailed or tarred to the surface requiring protection.

Reduce your operating costs, and assure continuous operation of your plant, by protecting all abraded surfaces with Armorite. Write for Bulletin 9010.

THE B. F. GOODRICH RUBBER COMPANY
Established 1870 Akron, Ohio

Goodrich *Vulcalock Products*



Merco Nordstrom Valves

IN the above photograph, showing a battery of Wilfley centrifugal pumps handling slurry in a cement plant, is also illustrated a typical installation of Nordstrom Valves in slurry line service. The valves are clearly seen on the discharge lines leading up from the pumps.

Wet process plants built within the past several years are almost without exception fitted with Nordstrom Valves. Inasmuch as they offer the one successful method of maintaining ***perfect valve action and control*** on slurry lines, Nordstrom Valves are today considered indispensable by cement plant engineers and operating men everywhere. The Nordstrom principle of hydraulic action—by which a special lubricant performs a double duty as an actuating and lubricating medium—provides a valve that ***won't stick or leak,*** regardless of what is being carried through the line. In addition to cement slurry, Nordstrom Valves are equally adaptable and widely used on steam, water, gas, oil, and air lines.

Furnished in all sizes from 1/2" to 24"

MERCO NORDSTROM VALVE COMPANY

SUBSIDIARY OF THE MERRILL COMPANY

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Dorrco Doings in 1927

THE year just closed has been one of tightening competition with lesser margins in most lines, and a disappointment to many in the total business done. In Europe it has seen the formation of an international chemical cartel as the result of the apparent success of the steel combination and a general preparation for intensive work with a lessening of uneconomic competition and a pooling of knowledge and experience in certain lines.

Although during most of the year a note of uncertainty was heard, the stock market showed confidence in the future and at the close of the year pointed towards prosperity in 1928.

Our own year has been one of better coordination with many minor advances made and several major developments that should make their contributions to the industries which we serve during the coming year. As our work has developed in different fields it has sometimes seemed as if we were spreading "too thin," and would have difficulty in really grasping the problems to be met in so many varied industries. Experience has shown, however, that our real opportunities have been greater because of it. A recent advance in Sanitary Engineering, for instance, was made possible by the use of our specialized knowledge gained in metallurgical work.

—•—

SERVICE—The service work of the Company, including supervision of installation, inspection, initial operation, and adjustment of our equipment, as well as the "trouble shooting" that inevitably arises from time to time, has now been centralized in a Service Division of our Engineering Department. This means complete coordination from the placing of the order until the new equipment is finally adjusted and running smoothly, and the operators are well trained.

THE DORRCO FILTER—As a result of a careful study extending over more than a year, we have introduced a new and distinctive type of continuous rotary vacuum filter for general filtration work. Certain features of this machine give it a somewhat broader field of utility than is generally assigned to vacuum filtration of finely divided solids.

CLOSED CIRCUIT GRINDING—Finer grinding generally required by selective flotation has called for improvment in grinding efficiency and has resulted in higher circulating loads and larger classifying units. At one plant 42 Model C Classifiers which have served well for ten years, are being replaced by new, very heavy type Model D's. Closed Circuit Grinding in primary as well as secondary circuits keeps advancing, with the Bowl Classifier in greater demand, and one cyanide mill doing all its agitation before final overflow.

The great progress made in automatic regulation of complicated manufacturing processes has made automatic feed regulation for closed circuit grinding appear an easy step. We have been working at it for a long time and believe we have now developed a control that will regulate conditions of feed or product and give the greatest grinding efficiency under widely varying conditions.

BEET SUGAR—Research and development work over several seasons has enabled us to perfect a process for making first carbonation automatically continuous and giving a controlled product of uniform quick-settling and filtering properties.

THE DORRCO SAND WASHER—The "age of concrete" has required enormous quantities of sand and gravel, produced to rigid specifications. Our contribution has been the Dorrco Sand Washer used on dredges and stationary plants and washing as much as 150 tons of sand per hour.

THE LIMIT!—When we built a Dorr Thickener 200′ in diameter some years ago it seemed very large. We have built many since, but this year our friends of the Miami Copper, where records in other lines have also been broken, have asked us to build a 325′ Thickener to dewater 16,000 tons of tailings per day. Our engineering Department say they will go further if asked.

SANITARY ENGINEERING—Sewage Treatment continues to make rapid progress, hastened by the realization that continuous mechanical operations can replace batch treatment and hand labor.

The Dorrco Bar Screen is now being installed at the world's largest sewage plant in Chicago — another unit operation mechanicalized.

An investigation covering the past year has resulted in the development of equipment for the continuous removal of clean grit or fine sand from sewage, before treatment. This avoids the periodical interruption of operation of grit chambers for the removal of accumulated solids.

Our new Square Traction Clarifier is being widely installed for sedimentation in both sewage and water works. After thorough experimentation it was adopted by St. Louis to remove the silt from Missouri River water both before and after treatment with chemicals. Four 150′ units are now under construction.

Separate sludge digestion has been adopted for the majority of installations contracted for in 1927. One of the largest plants of this type, put into operation this year at Sioux Falls, S. D., includes Dorr Clarifiers and the new type of Dorr Digester, which utilizes the gas generated by digestion to maintain the optimum temperature for the bacterial activity desired. In warmer climates the gas is available for power and lighting.

Our new Impeller Agitator, for thorough but gentle mixing to assist in floc formation, saved 45.5% of the chemicals required in one water treatment plant.

FOREIGN—We have in our New York office a four-foot globe and we take great pride in its varicolored pins showing installations all over the world in different industries. Our European associates have added many during the past year. They represent, among others, causticizing in the biggest paper mill in Europe, metallurgy in the Polish mine operated so well by Anaconda, chemical plants in Germany, sewage treatment in France and Germany, while a red pin stands for the biggest leaching plant in Africa.

Our Mr. Spicer is headed for Australia and the East. When he made the same trip in 1911 it meant that one-fifth of the staff had gone.

—•—

Time has brought many changes but we feel that the best it has given us is those friends scattered over the mining camps of the world, and in more recent years through industrial plants as well, who have helped us by kindly criticisms and suggestions to develop our work. It might interest them to know that our statistician claims that over 95% of the gold and silver, over 90% of the lead and copper, 85% of the zinc and 100% of the aluminum produced in North America comes into contact with our equipment.

We cannot see the future, but if a loyal body of workers means anything, I can assure our friends that we shall go forward as in the past, proud of what we can contribute to the world of industry.

John V. N. Dorr

247 Park Avenue New York City

DORRCO

Starts Off At a New Angle New Year's Day and Every Other Day

THE Monighan Walking Dragline Excavator starts off at a new angle New Year's Day—and every other day. Because of its walking traction, there isn't any angle the Monighan can't take.

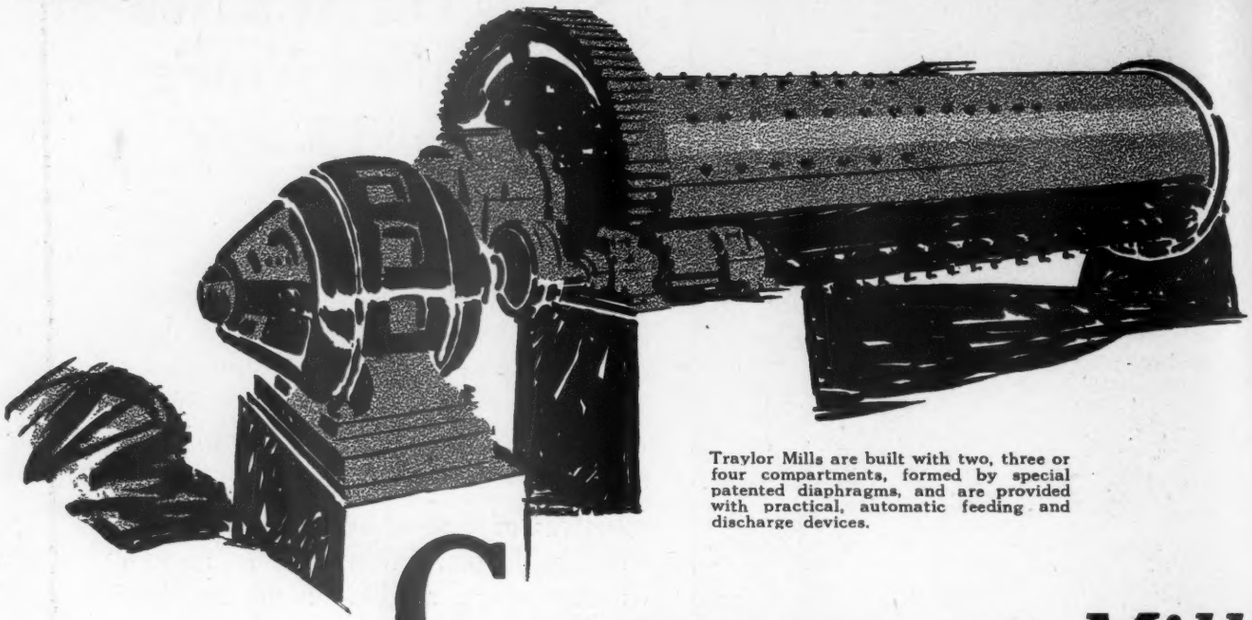
Instead of making long, circular turns to avoid obstructions, the Monighan makes sharp angular turns or side-steps. It can always keep in the most advantageous working position with practically no loss of time or travel.

Whether the sun's shining, or the rain's pouring down; whether the surface is hard, or soft and marshy, level or uneven, the Monighan Walker can always step up, or step back, or to right or to the left. You can't beat it!

Monighan Machine Company
949 N. Kilpatrick Ave. Chicago, Ill.

MONIGHAN

TRAYLOR



Traylor Mills are built with two, three or four compartments, formed by special patented diaphragms, and are provided with practical, automatic feeding and discharge devices.

Compartment Mills

TRAYLOR PRODUCTS

Rotary Kilns, Dryers and Coolers, Compartment Mills, Jaw and Gyratory Crushers, Crushing Rolls, Rotary Screens, Feeders, Grizzlies, Elevators, Complete Stone, Cement, Slag and Rock Asphalt Plants.

THE cement industry—progressive industry that it is—has been quick to recognize and appreciate the fundamental advantages of Traylor Compartment Mills as adapted to present day grinding practice. These mills have been adopted by fifteen of the leading cement plants—with an unvarying result of efficient, economical operation.

Automatic Feed—Automatic Discharge
Two, Three or Four Compartments

Write or wire our nearest office for Bulletin 1108

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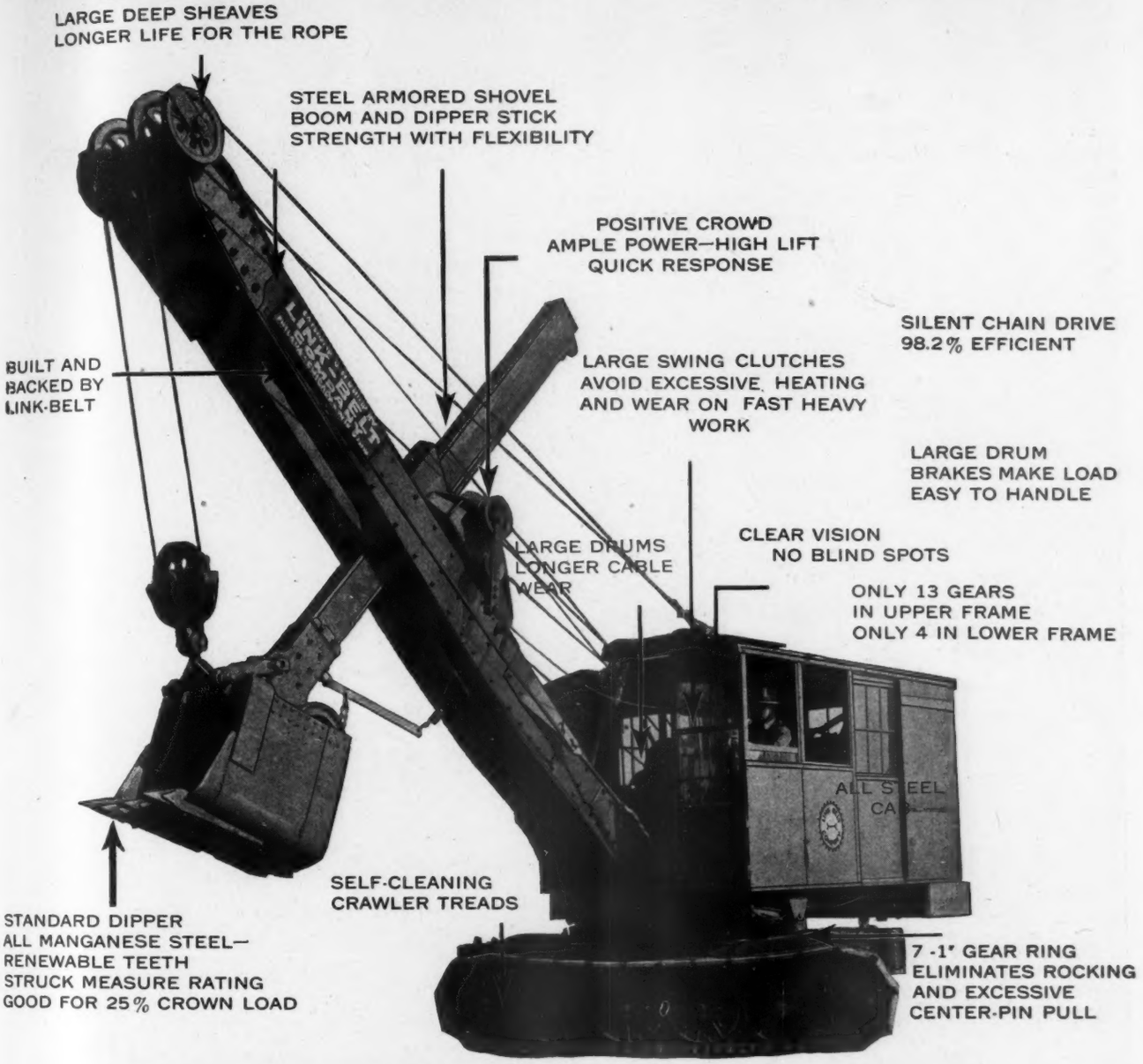

INTO our line of Link-Belt Shovels we have put all the experience and skill of our designers: employed all of the superior manufacturing facilities of our modern shops. They are the best shovels we know how to build. These are the reasons why their performance has earned such nation wide acceptance by those who handle materials. Send for Catalog No. 895.

LINK-BELT COMPANY 3201

Leading manufacturers of Elevating, Conveying, and Power Transmission Machinery

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LINK-BELT SHOVEL

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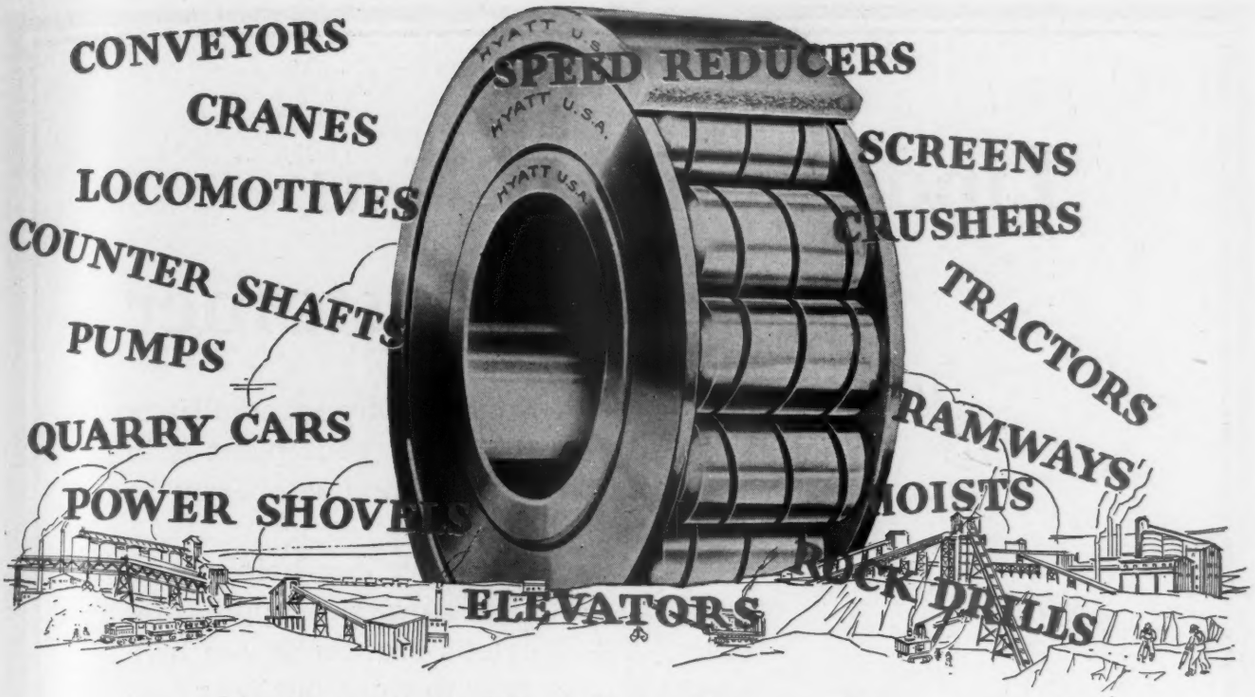

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Hyatt Roller Bearings are widely used in America's cement mills and quarries.

Unwavering satisfaction in a variety of applications has earned for Hyatt a record of bearing performance that is unparalleled in this industry.

The names of manufacturers using Hyatt bearings read like a selection of red letter leaders. Here again, as in farm, automotive and industrial applications, Hyatt has proved that good equipment and good bearings are inseparable.

When the machinery you purchase is Hyatt equipped, you have assurance of bearing satisfaction which includes longer life, freedom from constant lubrication and the elimination of bearing trouble.

Many of the equipment builders using Hyatt Roller Bearings are now identifying their products with the *Mark of Hyatt Protection**. Confidence, born of experience, has made this symbol a recognized buying mark. Have it guide you in your next purchase.

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* EQUIPPED WITH HYATT ROLLER BEARINGS

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PRODUCT OF GENERAL MOTORS

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Portability

Repair jobs do not respect convenience. On one side of the plant there is a steam leak that must be stopped quickly by oxwelding. Or, a machine breaks on the other side of the plant. Again a hurry call for the welder. Time after time oxwelding equipment must be transported with speed.

Then the convenience of moving a cylinder of Prest-O-Lite dissolved acetylene becomes apparent. The WK cylinder contains about 270 cubic feet of gas and weighs much less than even the smallest welding type generator; the WC size (100 cu. ft. capacity) offers a still greater factor of portability. That is why cylinders are always used where portability is essential.

THE PREST-O-LITE COMPANY, INC.
Unit of Union Carbide and Carbon Corporation

UCC

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ARROWHEAD GRAVEL

ROLMAN
DOUBLE LOCK MESH WOVEN MANGANESE STEEL
SCREENS

Sept. 23, 1927

E. L. Pemberton Co.,
30 Church St.,
New York City.

Gentlemen:-

Replying to your letter of September 21st would say we have used the Rolman screens now for two seasons and they are in very good shape and are entirely satisfactory and it is our intention to install additional screens of this make during next winter and have them in use next year.

Very truly yours,

THE ATLAS SAND GRAVEL & STONE CO.

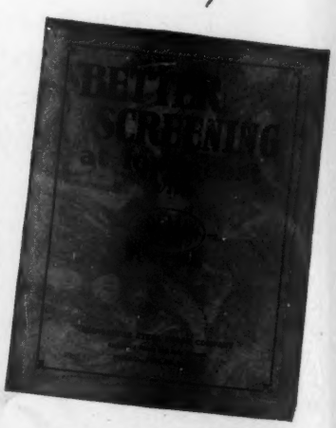
H.

The additional ROL-MAN Screens mentioned in the above letter have since been ordered by Atlas Sand, Gravel & Stone Co.—fair proof that these modern screens have saved this company money.

The equipment selections that you make this winter will have an important bearing upon the success of your 1928 operation. With this in mind it is well to consider that the tendency in present-day screening plants is all toward the use of ROL-MAN Manganese Steel Screens for highest operating efficiency and lowest possible per-ton screening cost.

Small wonder that successful producers recommend them, for ROL-MAN Manganese Steel Screens produce cleaner, more accurately graded material, increase productive capacity 30% to 50% and outlast ordinary screens from 10 to 30 times. That means successful and PROFITABLE operation.

Check over your screen section requirements now, and place your orders for ROL-MAN Screens promptly for quick shipment.



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Richmond St. & Erie Ave., Philadelphia, Penna.

MANUFACTURERS OF ROL-MAN ROLLED MANGANESE STEEL PRODUCTS

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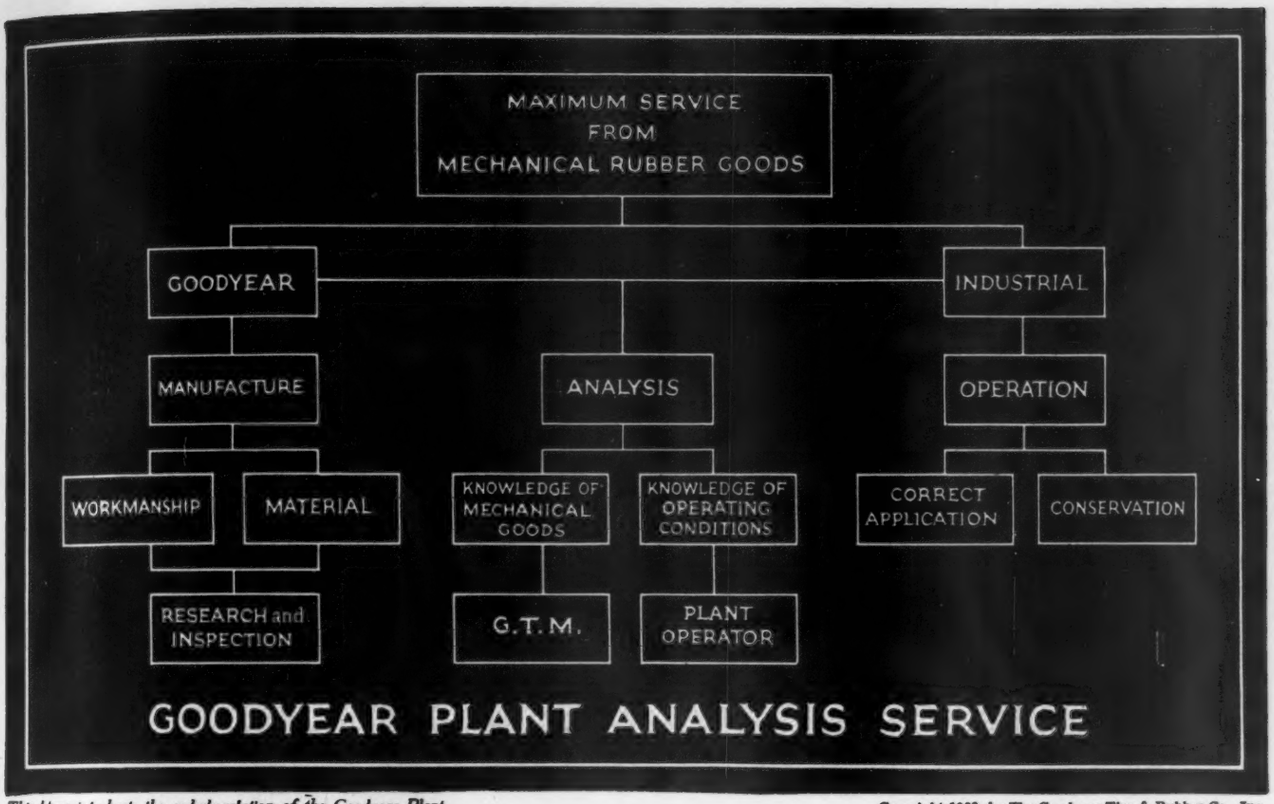
Old Colony Bldg.

LOS ANGELES
320 S. San Pedro St.

This booklet contains the information that you will want about ROL-MAN Manganese Steel Screens, as well as definite proof that they will save you money. We shall be glad to send you a copy upon request.



This blueprint charts the orderly relation of the Goodyear Plant Analysis Plan for maximum service from mechanical rubber goods

The Plant Analysis Plan—and the G. T. M.

This chart is important to every man who has to deal with belting, hose or packing problems. It shows the principal factors in the Goodyear Plant Analysis Plan, and makes clear the part that is played in more efficient, economical plant equipment by the G. T. M.—Goodyear Technical Man.

You know the idea behind the Goodyear Analysis Service. It is simply this, that you are bound to get more work and better work, done more efficiently and more economically, from the *right* mechanical rubber goods, specified to the job. How the *right* product is found by analysis is shown on this blueprint chart.

At the top you see the G. T. M. and your plant operator, each applying his special experience and knowledge to the problem in hand, whether it be a single drive or an entire plant equipment. They make the analysis together.

The G. T. M. is an expert on mechanical rubber goods. He knows their special properties. He is trained in the science of their specification and application. His work takes him into many plants, in many industries, so that he is familiar with most transmission and conveying problems, and is a practical authority on many of them.

When he comes to your plant, he comes as a friendly analyst of your operating problems, your troubles, maybe. He doesn't pretend to know it all. He gladly takes the advice of your superintendent and engineer. He gives close attention to their experienced knowledge of your operating conditions.

His entire purpose is to fit what he knows about belting, hose or packing to the demonstrated conditions of service in your plant. If he can find out what you can use to best advantage, he will recommend it to you. Then, on your order, Goodyear will build your equipment according to those approved specifications. And after it is installed, the G. T. M. will follow it up with a service that will see that you get out of your equipment all the value built into it by this scientific analysis and careful manufacture.

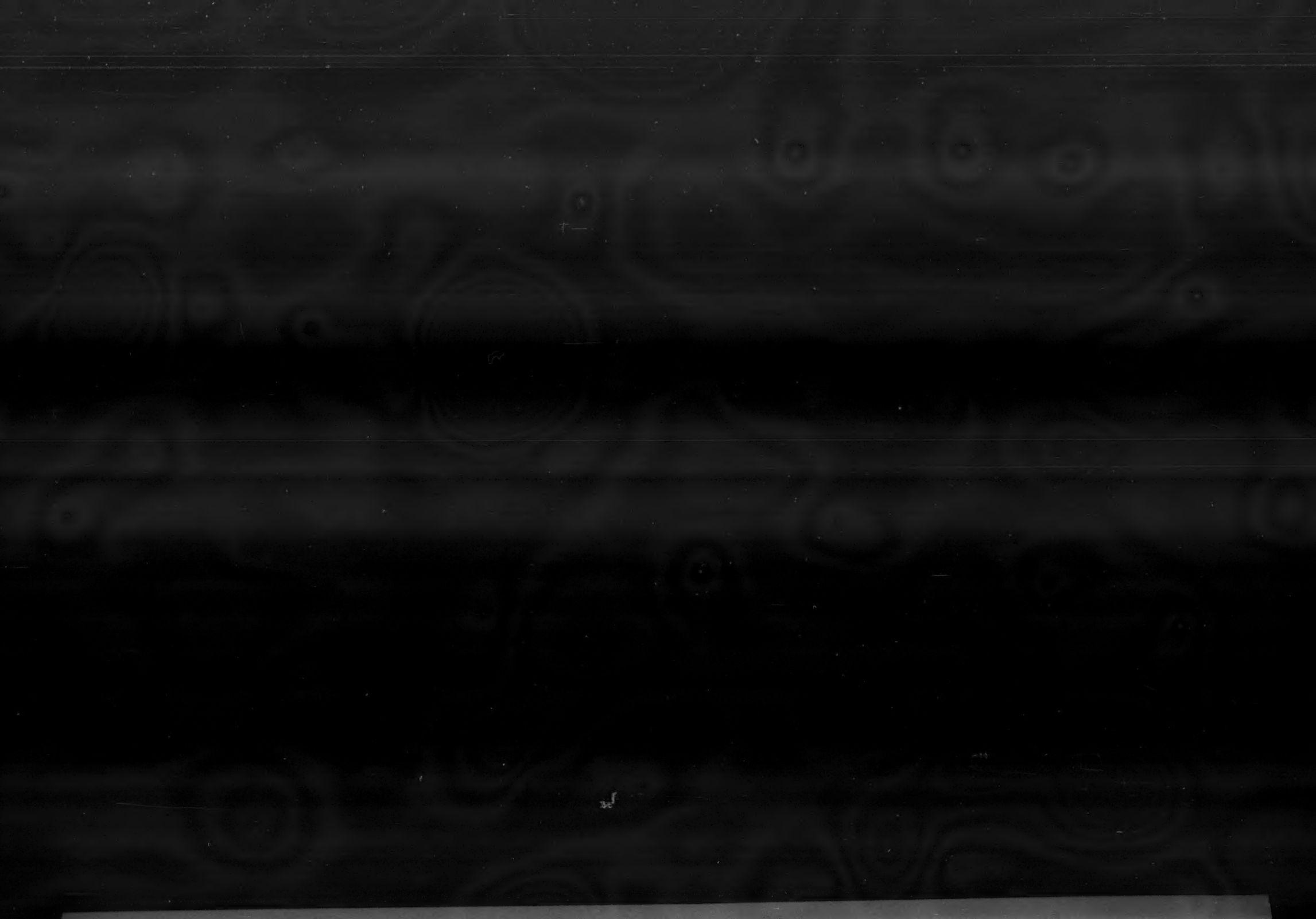
Doesn't it stand to reason that you are likely to get the utmost in trouble-free, long-wearing service out of that kind of equipment? The proof of the Goodyear Analysis Plan is in the records—many of them published in these pages during the past ten years—of better, more productive and more economical work done by G. T. M. specified goods in hundreds of plants, in every line of industry.

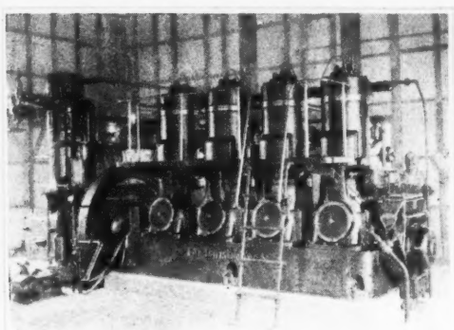
There is a G. T. M. in your neighborhood. It may pay you well to have him analyze your needs or problems. If you want to get in touch with him, or receive detailed information about the service Goodyear Mechanical Rubber Goods—belts, hose, valves and packing—are giving in your particular industry, write to Goodyear, Akron, Ohio, or Los Angeles, California.

Goodyear Means Good Wear

VALVES · PACKING BELTS · HOSE

GOODYEAR





The DIESEL
that says:

"Business as usual"

The characteristic most responsible for F-M leadership is the ability of the F-M Diesel to deliver always—to keep doing "business as usual."

Behind that characteristic is unmatched simplicity of design carried out with mechanical precision that only time, and effort, and unequaled manufacturing facilities could have developed.

The great fuel economy of the Diesel engine—that advantage which is shared by all Diesels—means much or little, depending solely on operating and maintenance costs. With no valves to grind and set, with no high pressure auxiliaries, with fewer parts, the Fairbanks-Morse Diesel has cut operating and maintenance costs to the bone.

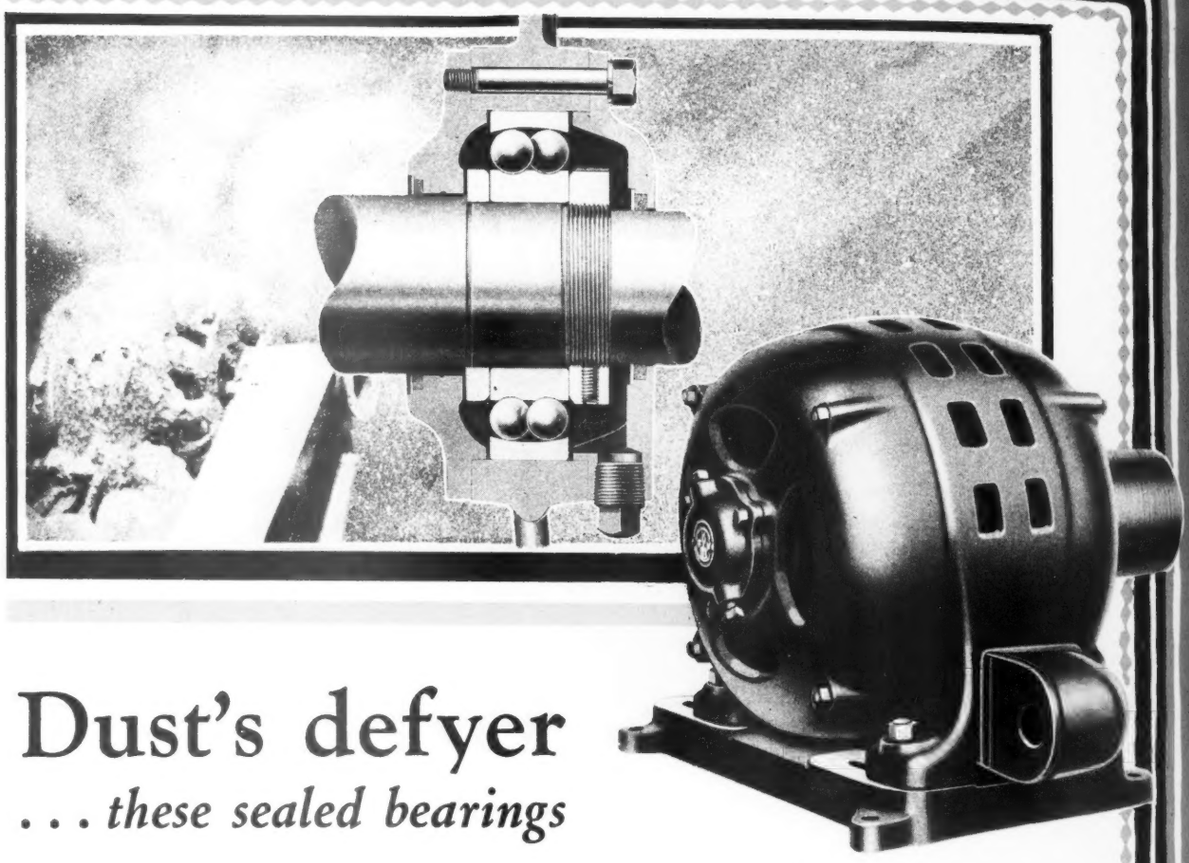
This is sharply brought out in a check-up of 345 Diesel units, many of which have seen 10 to 12 years of service. The average maintenance cost of these F-M engines, the total operating time of which is 1,971 engine years, was less than $56.00 per year.

* * *

There is an F-M Diesel for practically every power purpose in connection with the quarrying, crushing and handling of rock, sand, and gravel—for cranes, draglines, dredges, crushers, millpower, towboats, and similar applications. All have the famous F-M simplicity and the high overall economy that goes with it.

FAIRBANKS-MORSE

DIESEL ENGINES PUMPS · MOTORS SCALES



Dust's defyer

. . . *these sealed bearings*

The ball bearings on F-M Motors are not only *mechanically* sealed by the housings, but are also *self-sealed* by the grease lubricant. They are *totally* dustproof bearings.

Only once a year is it necessary to re-lubricate these bearings and, by using FMCO grease in self-measuring tubes, the greasing operation is quickly performed without any possibility of dust entering the bearing.

Contrast this with the oiling of a sleeve-bearing motor—where oil holes are covered with gritty dust that is washed into bearings every time the oil can is used. This is just one of the many reasons for the ever-growing use of F-M Ball Bearing Motors in mills and quarries.

FAIRBANKS, MORSE & CO., *Chicago*

28 branches throughout the United States, each with a service station

FAIRBANKS-MORSE

Pioneer Manufacturers of

ball bearing motors

AEOA05.9

KEEP THE DRAG CHAIN DRAGGING

CARRYING white hot clinker from the kiln will wear out any metal—because of the severe abrasive action of hot cement. That is why the drag chain wears out.

Haynes Stellite's claim to fame is that it does not yield even under such trying conditions. That doesn't mean that Stellite will last forever, but it will outwear any other metal from three to five times. And then another coat of Haynes Stellite applied to the worn surface with the oxy-acetylene flame makes the part as good as new.

The Bethlehem Foundry and Machine Company of Bethlehem, Pennsylvania, makers of cement mill equipment, have developed Stellited drag chains and rider bars. They have this to say: "Stellite is the only metal known that withstands the excessive wear of the chain at the high temperature produced by the hot clinkers as they are discharged from the kiln."

Our booklet, "Stelliting of Metal Parts in Cement Mills," explains the process more fully and suggests other places in the mill where Haynes Stellite can be used to just as good advantage.

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation

UCC

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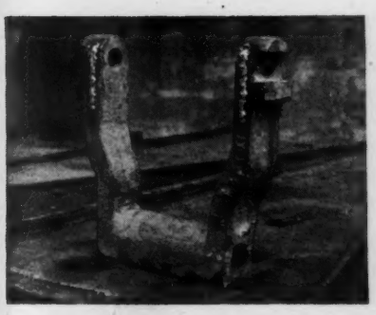
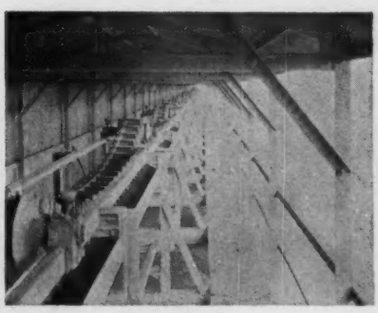




Stelliting with

HAYNES STELLITE

The Cost of Dust!

Every particle of cement dust that finds its way into a bearing or any wearing part of machinery, is certain to cost money. Cement dust is nearly as hard as a diamond, and its abrasive action just as severe. Cement dust causes unnecessary maintenance **costs.**

Also—dust flying free is a wasted profit, another cost.

The Value of Dust!

When it is arrested, bagged and sold, cement dust has the same cash value as the cement in your silos. Cement plants that are arresting the dust at their baggers, bag cleaners and grinders have learned that the value of the dust arrested pays for the arrester and pays a consistent profit.

One plant reports a saving of $25,000 in one year by using Sly dust arresters!

If your plant is dusty, write for Bulletin S-125. Or a Sly Engineer, familiar with dust collection in cement plants, will be glad to call and study conditions in your plant.

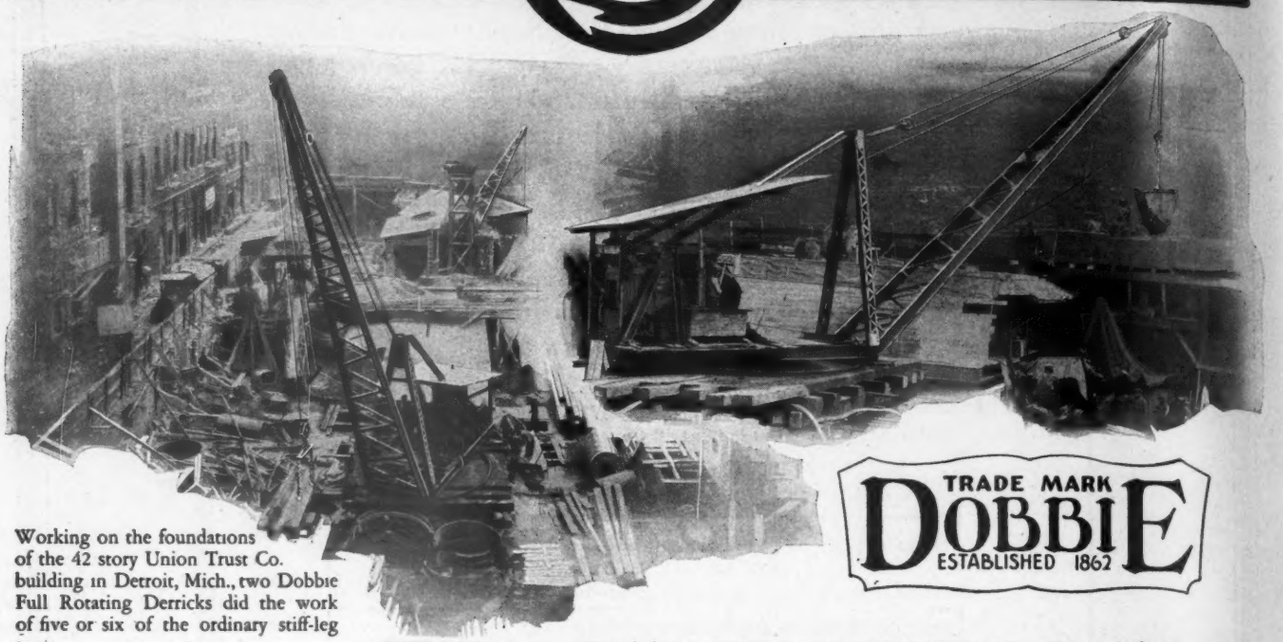
The W. W. Sly Manufacturing Company
Cleveland, Ohio
Branches in Principal Cities

SLY Dust Arresters

New in Design --- New in Performance

Fast! *Economical!*

DOBBIE FULL ROTATING DERRICK



Working on the foundations of the 42 story Union Trust Co. building in Detroit, Mich., two Dobbie Full Rotating Derricks did the work of five or six of the ordinary stiff-leg type.

TRADE MARK DOBBIE ESTABLISHED 1862

THE new Dobbie FULL ROTATING Derrick is a development that marks a revolutionary advance in design and efficiency of derrick equipment. For a multitude of jobs on which derricks can effectively be used, this *"full swing"* derrick has a tremendous advantage over the ordinary stiff-leg derrick with its 3/4 swing —since the full rotating feature increases the working area by 75 per cent.

This new derrick revolves on a single circular track—on roller bearing equipped wheels. It is unusually fast—capable of making 2.4 revolutions per minute. Construction is of steel throughout and operation is by a Mundy 3-speed Hoist powered by a 60 hp. engine.

Write for full details regarding this new development.

TO EQUIPMENT DISTRIBUTORS

Some Exclusive Sales Territories are now Available.

A Complete Stock of

Hand Winches
Sheaves
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DOBBIE DERRICKS

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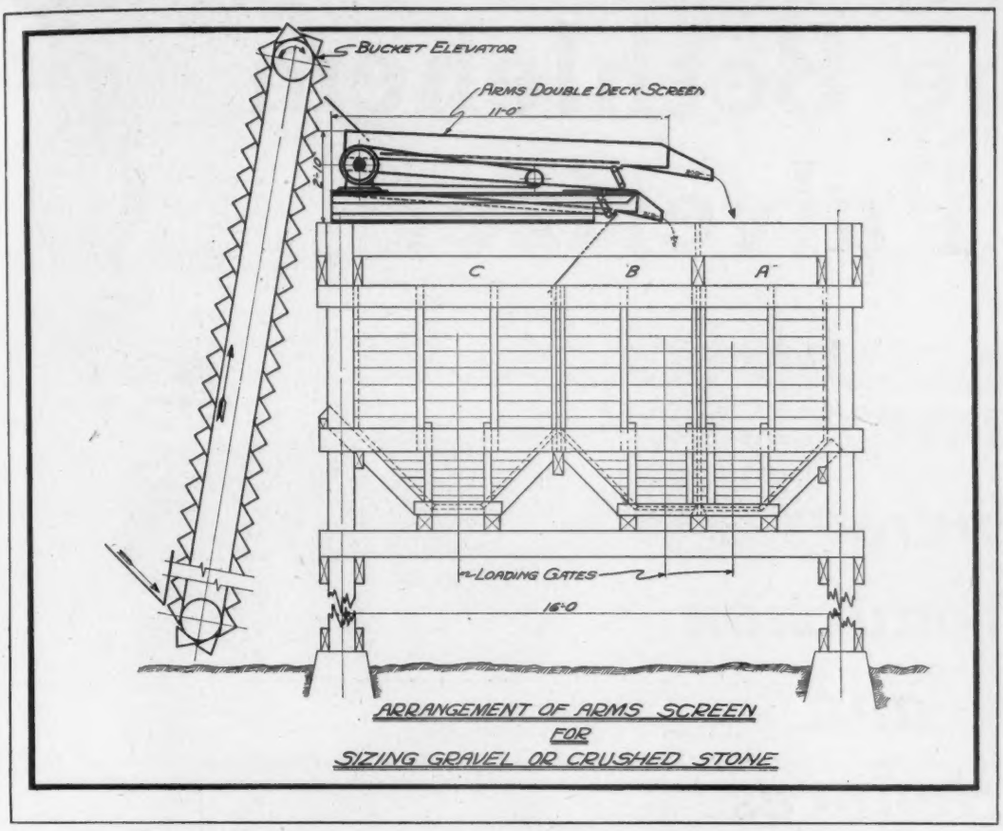

ARRANGEMENT OF ARMS SCREEN
FOR
SIZING GRAVEL OR CRUSHED STONE

Unusual Capacity—Maximum Efficiency

ARMS Reciprocating Screens, with a minimum power requirement, combine the high capacity characteristic of the steeply pitched screen, the equally important feature of minimum head room, and the efficient screening peculiar to flat type screen.

Reciprocating action and vibration are secured through the medium of ball bearing eccentrics. Minimum external vibration, all parts of ample size, made of steel for severe service, dust proof bearings, and only 2 to 4 horsepower motors are necessary for efficient driving. Inactive screening area is entirely eliminated, no springs or cushions are used to dampen vibration, few parts are required, and only 2 ft. head room is necessary.

Arms Horizontal Screens, a typical installation of which is shown for a three part separation of gravel, crushed stone or other materials, are simple, inexpensive, and offer the most economic method of producing graded sizes.

Let us give you complete details on these wonderfully efficient, maintenance-free screens —profit by our knowledge and experience as designing engineers. Write for details.

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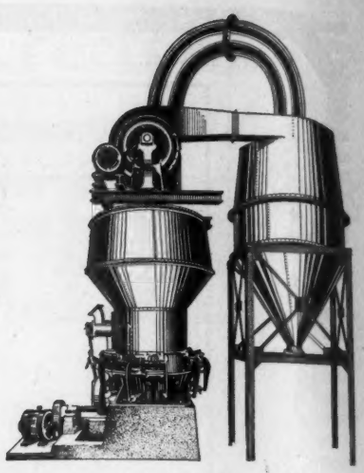
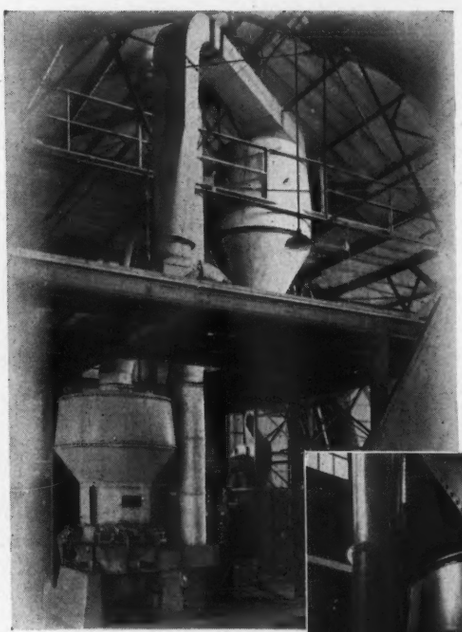
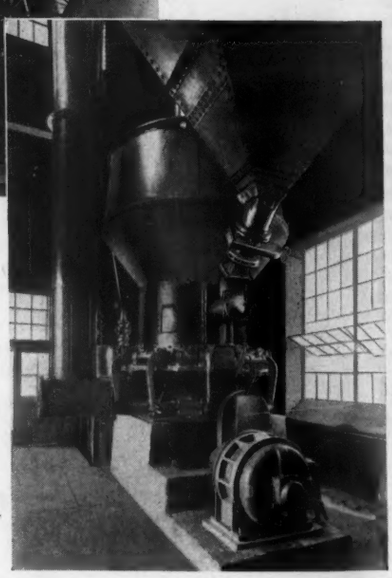
The Bethlehem Pulverizer



Increases Production and Reduces Costs





Left:

A Bethlehem Pulverizer installation in a rock products plant.

Below:

A Bethlehem Pulverizer installation in a pulverized coal burning power plant.

THE installation of a Bethlehem Pulverizer in any grinding process results in Increased Production, Reduced Power Consumption, and Reduced Operating Costs.

The Bethlehem Pulverizer is a Dry Grinding Mill pulverizing a wide range of materials to any degree of fineness up to 325 mesh.

Our Engineers are always available and are ready to assist you in the solution of your grinding problems.

A copy of catalog J will be forwarded on request

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BETHLEHEM

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Thew Center Drive applied to swing, hoist and crowd gives the same rugged service that has made Thew Center Drive Trucks famous.

SHOVEL power must get to the material before it can dig. Thew Center Drive gets the power to the job in the most direct line—to hoist, swing, crowd as well as travel.

The Thew Center Drive means fewer parts—full sized rugged parts that give all-day-long performance and freedom from costly breakdown delays.

More power and fewer delays mean greater profits to you. Let us tell you why—and how—Thew and Thew only, has Center Drive.

THE THEW SHOVEL COMPANY
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Gasoline, Steam and Electric Shovels Cranes Draglines

THEW

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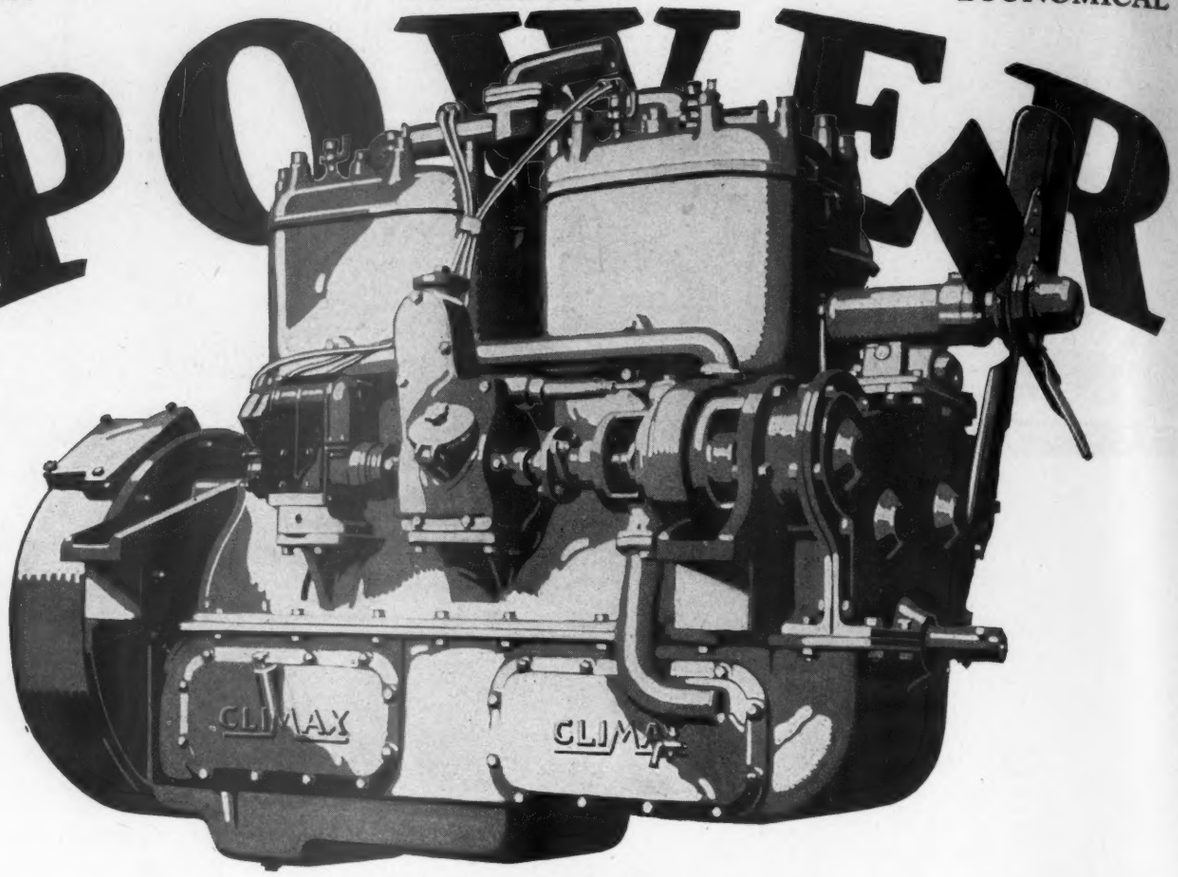
5

HUSKY POWERFUL ECONOMICAL

POWER



Climax Fuel Economy

Climax, 4 cylinder, 5"x6½", 50 H. P. Engine on Four-Wheel Drive Tractor. "Fuel consumption runs from 1½ to 3 gallons of coal oil (kerosene), per hour, depending on work, rarely ever over one quart of lubricating oil daily, and on an average of two quarts of water per day."—V. A. Van Horn, Pres., Four Drive Tractors, Ltd., Big Rapids, Michigan.

Climax, 4 cylinder, 5½"x7", 70 H. P. Engine on two stand cotton gin. "Relative to engine, I want to say it is a wonder. I have been connected with cotton gins for over 25 years and this is the cheapest and steadiest power so far in my experience. Have used water, steam and crude oil burners." —Ark-Mo Cotton Co., By F. W. Cox, Owner, Reyno, Arkansas.

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Climax, 4 cylinder, 5½"x7", 70 H. P. Engine on Crane-Excavators. "Our Erecting Engineers report that the fuel consumption ranges from 18 to 22 gallons of gasoline in 9 or 10 hours." —Morgan Ramsay, Asst. to Pres., Bay City Dredge Works, Bay City, Michigan.

Climax, 4 cylinder, 5½"x7", 70 H. P. Engine on shovel. "We use only about 3 gallons of gas an hour." —R. Nazzaro, President, Nazzaro & Guerriero, Inc., Brooklyn, N. Y.

CLIMAX ENGINEERING COMPANY, 78 W. 18th Ave., Clinton, Iowa

CLIMAX

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TRUSTWORTHY ENGINES

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Saving by the YARD

ONE "Caterpillar" and four Euclid 1½ yd. scrapers cut banks, move and grade 24,000 yards of heavy, hard clay on Ohio road job—in 60 days at 8½ cents a yard—two 8 hour shifts—2 men per shift!

A tremendous saving with less man power, more traction power!

Daily, "Caterpillars" hang up such records of stamina and performance—in all seasons and soil and weathers!

THERE IS A "CATERPILLAR" DEALER NEAR YOU

better
quicker
cheaper

(O. C. Scott, contractor —*between Harpersfield and Austinburg, Ohio.*)

CATERPILLAR TRACTOR CO.

Executive Offices: San Leandro, California, U.S.A.
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Stand up under all conditions.

Known as "THE DRILL THAT DRILLS."

Fulfills the demand for an all weather drill giving maximum in efficiency — durability — economical maintenance and operation.

Those who have used the "NEW TYPE CLIPPER" drill have the highest praise and tell us of the savings in drilling costs effected.

We solicit your inquiries.

The Loomis Machine Company

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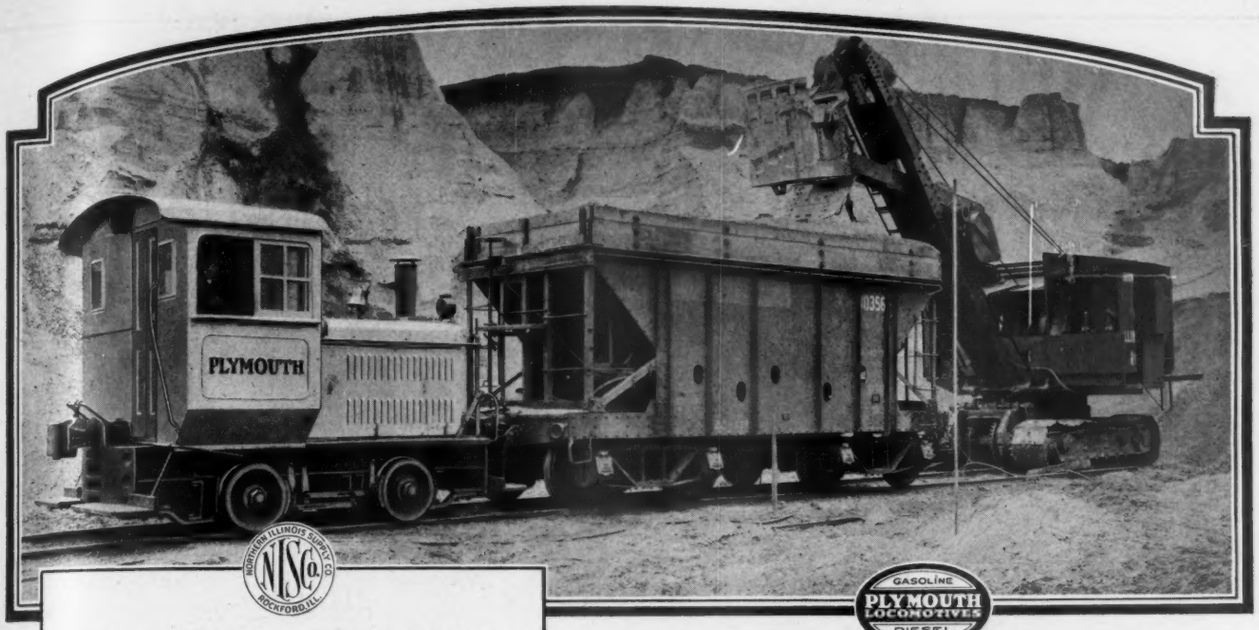

NORTHERN ILLINOIS SUPPLY COMPANY
WASHED SAND AND GRAVEL
COAL AND WOOD

Rockford, Ill., Aug. 26, 1927

The Fate-Root-Heath Co.
Plymouth, Ohio.

Gentlemen:

We have been using one of your twelve-ton gasoline locomotives at our sand and gravel plant at Rockford, Ill., for about one and one-half years.

We think we have given it a thorough trial, and we do not hesitate to say to our friends and to the public that the 12-ton Plymouth engine has given perfect satisfaction at our plant.

Yours truly,

Northern Illinois Supply Co.

S. A. Gibson

Treasurer

The Saving here is 30%

N.I.S.Co. Formerly Used Hydraulic Power

Another problem solved with a satisfying result by a Plymouth Gasoline Locomotive.

It is interesting to see the different types of haulage power being replaced by Plymouth Locomotives, – mules, horses – winches – steam dinkies–electric motors, and what not.

After a year or so we hear from the owner giving us the job they have to do and the saving they have effected over the old method.

This 12-ton Plymouth went to Rockford, Illinois, in May of 1926, replacing an hydraulic arrangement hauling sand and gravel in a car weighing 130,000 lbs., loaded, over a 1200 ft. track, having a one and one-half per cent grade. The net tonnage hauled per day of eight hours is 2000 tons. Mr Elmer Leason, Superintendent, in making this report, says the Plymouth has effected a saving of 30 per cent.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO

If it's a Track Haulage Problem There's a PLYMOUTH to Solve it

50 ton Diesel

Plymouth Diesel Locomotives are built in a full range of sizes from 10 to 50 tons. Designed to reduce fuel and operating costs to a minimum.

Write for descriptive literature and illustrations showing the wide adaptability of Plymouths to Haulage Problems.

PLYMOUTH
GASOLINE *Locomotives* DIESEL

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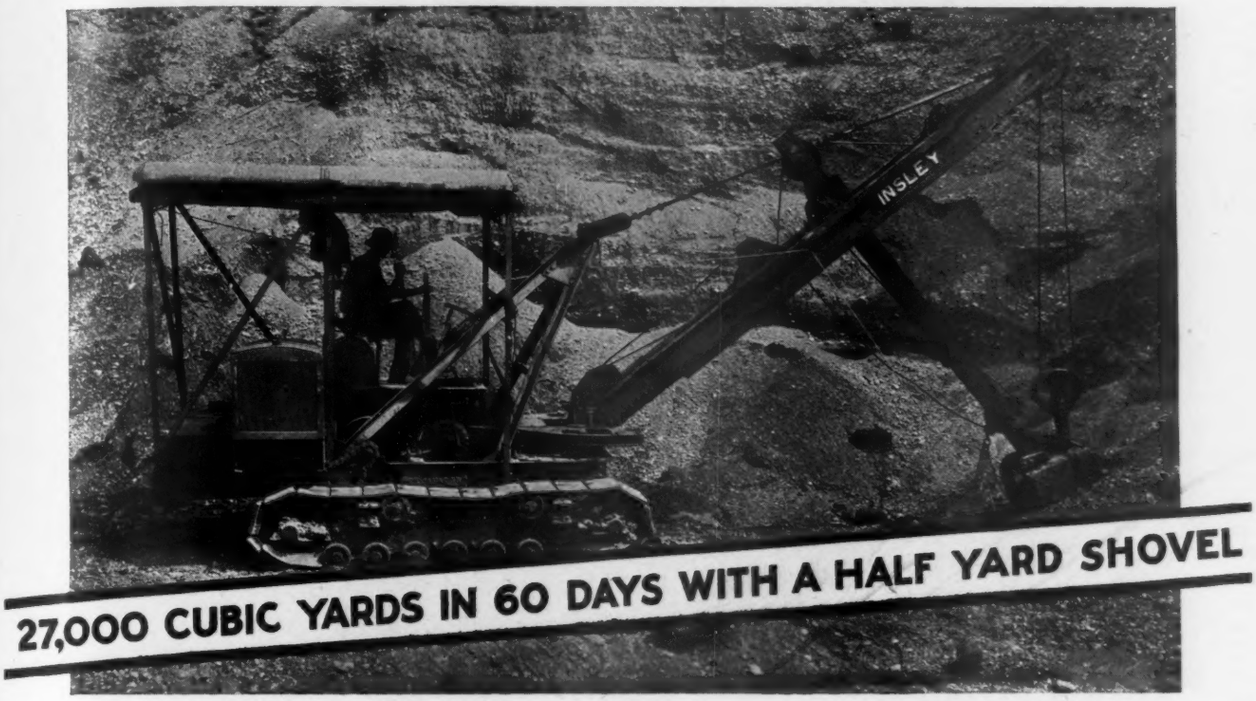
SHOVEL — Ditcher — Skimmer — Dragline — CRANE



PROFITABLE EXCAVATING

THAT is an average of 450 cubic yards a day, something which an Insley did in borrow pit work in Oklahoma. This Insley is only one of five which this same contractor owns and all five of them operate continuously at the same high speed. They build bridge approaches, dig sewers, grade streets and roads, handle material for the paver, and anything else there is to do.

Mind you, 450 yards a day, day after day, with an average cost for gas and oil of $2.90 and an operator's wages. Can you beat it?

Add to that the fact that an Insley costs less than any machine on the market that will do as much work. If you will only realize this you will have one or two of them yourself, instead of having a heavy investment in one large machine.


DITCHER


SKIMMER


DRAGLINE


CRANE

603

INSLEY MANUFACTURING COMPANY • Indianapolis

Engineers and Manufacturers

A 75 H.P. Motor Assures One-Yard Service in ROCK

–P&H rating means more than dipper size

½ Yd. . .	50 H.P.
¾ Yd. . .	55 H.P.
⅞ Yd. . .	65 H.P.
1 Yd. . .	75 H.P.
1¼ Yd. . .	95 H.P.

To turn out big yardage over a long period of time at the lowest cost *without excessive wear or depreciation*, a 1-yd. Shovel must have a 75 H. P. motor. With this power at his command, a P&H operator has no difficulty in maintaining high speed operation in *any* going—over 100 one-yard loads an hour being not unusual.

Bulletin 62-X gives full specifications on the five sizes in which P&H Shovels are made –it will gladly be sent on request

P&H

HARNISCHFEGER CORPORATION
Established in 1884
3865 National Avenue, Milwaukee, Wis.

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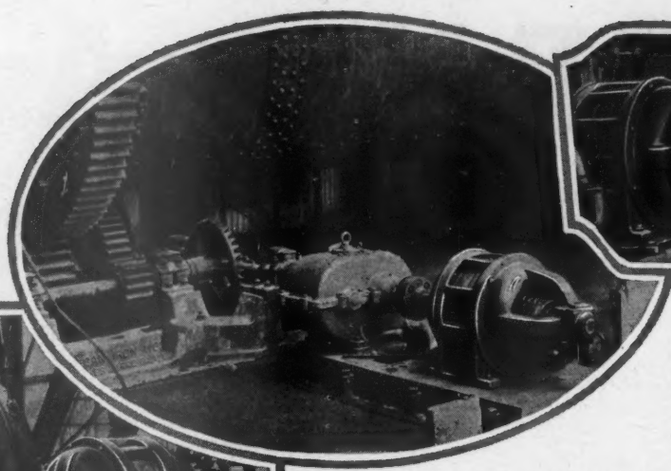
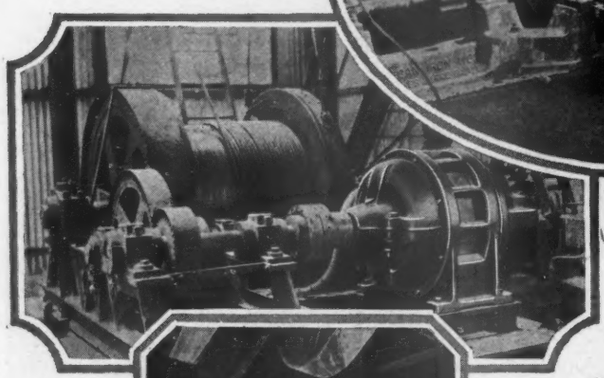


50-hp., 440-volt, 696-r.p.m. G-E induction motor operating 3-speed reversible incline hoist

100-hp., 440-volt, 875-r.p.m. G-E induction motor driving 42 by 48 rigid hammer crusher



Vulcan dryer—6 by 45 feet—driven by 25-hp., 440-volt, 840-r.p.m. G-E slip-ring induction motor

20-hp., 440-volt G-E induction motor driving 4-valve Bates sacker

The plant of the National Gypsum Company is completely electrified by G.E.

Complete electrification by G. E.—crusher, pulverizers, kilns, elevators, conveyors, everything—that's a big reason why the National Gypsum Company, one of the world's largest, is a leader in the industry. Twenty-two units, with a combined horsepower of 500, drive the machines that produce this Michigan company's wall-board and mixed plaster.

In gypsum plants—as in many prominent cement plants—G-E Motorized Power is installed because of proved performance.

Your nearest G-E office will gladly supply information. G-E experts in gypsum plant applications are always ready to assist you.

Apply the proper G-E motor and the correct G-E controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. Built in or otherwise connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.

Motorized Power
—fitted to every need

200-143

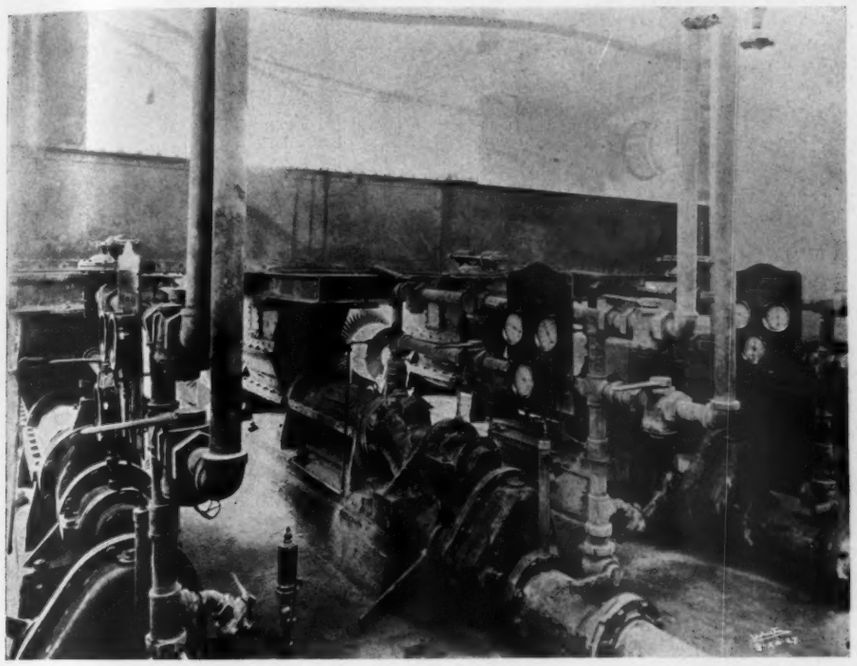
GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

FULLER KINYON SYSTEM

FOR

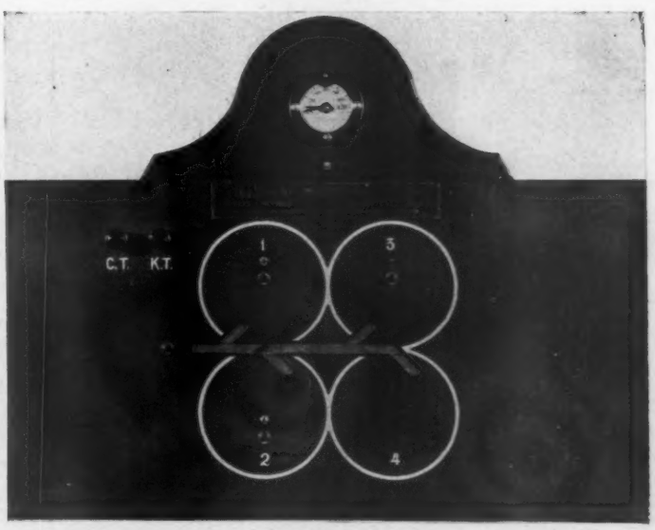
DRY CEMENT RAW MATERIAL MIXING AND BLENDING



A recent installation of three 10-in. Fuller-Kinyon pumps for blending and conveying cement raw material. The central pump is a spare and is connected to either system. Each pump has an hourly capacity of 275 tons

Fuller-Kinyon dry raw materials mixing and blending systems are adaptable to both old and new plants. They have adequately demonstrated that high quality cement can be made by the dry process with a minimum of supervision and at low cost. The blending and mixing system, under automatic time and remote control of the transport line valves, requires very little equipment additional to that normally required to transport raw material from the raw mill to raw storage, and from storage to kiln tanks.

A maximum of flexibility and convenience of operation is effected by interconnected pipe lines and by the automatic and remote control of the branch line diverting valves. These valves are normally operated automatically in a predetermined time interval and sequence, with provision for modifying the operation from a control and signal panel such as that shown in the photograph, which may be located in the chemist's laboratory, or any convenient point.

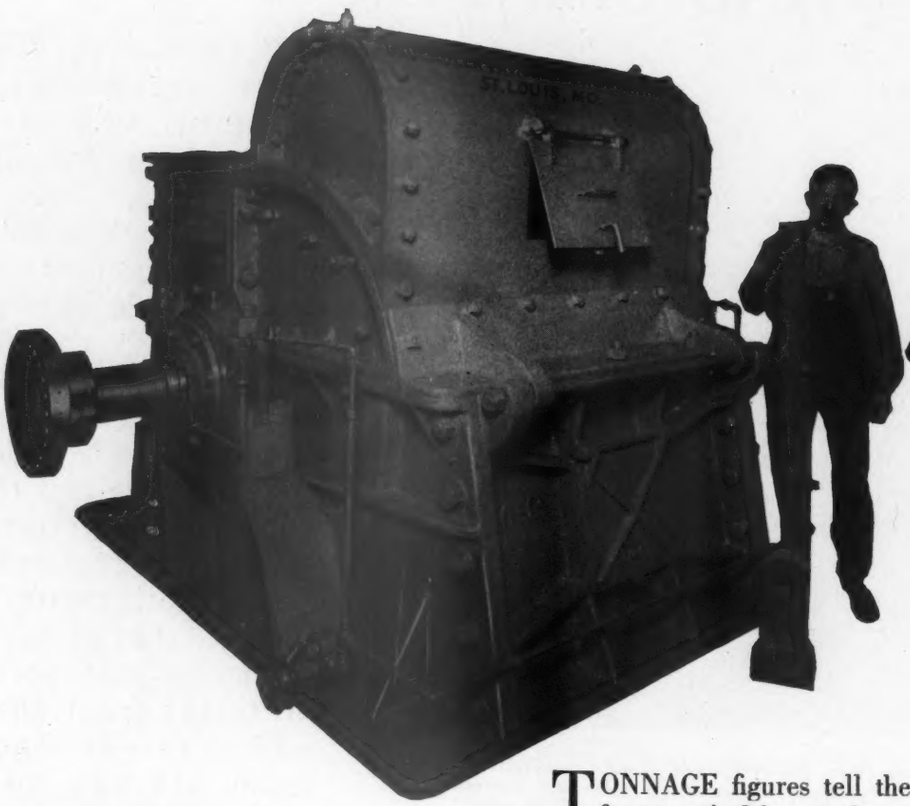


Four unit blending control and signal panel arranged for time and remote control of valves

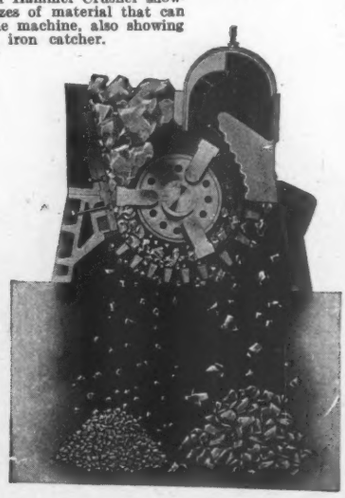
Write us for full particulars

FULLER COMPANY, CATASAUQUA, PA.

Over 300,000 Tons— Without Repairs



Cross Section of Hammer Crusher showing different sizes of material that can be made on one machine, also showing positive tramp iron catcher.



TONNAGE figures tell the story of crusher performance! Of *ruggedness, efficiency*, and operating economy.

In crushing over 300,000 tons without a single shutdown for repair, the New Heavy Duty Gruendler Timken Roller Bearing Swing Hammer Secondary Crusher has established a record for dependable performance that will be hard to beat. This record exemplifies in true fashion the extreme ruggedness and low operating and maintenance costs that are characteristic of the New Gruendler.

Installed and approved by the Dewey Portland Cement Company, Davenport, Iowa. Specified by the Marquette Cement Manufacturing Company, Chicago, for their LaSalle, Illinois, plant.

Don't fail to investigate the Gruendler—for the latest and best in Hammer Mill construction.

GRUENDLER PATENT CRUSHER & PULVERIZER COMPANY

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Hayward Standard Orange Peel Bucket. An all around contractor's bucket, used principally for sewer work, in gravel banks, removing overburden, dredging, excavating and rehandling material generally.

A power wheel bucket of the two line type, one line being used for closing and digging, the other for holding the bucket while it is opening and discharging.

Hayward Class E Clam Shell Bucket, with Ore Bowl. A power wheel bucket of ample closing power for handling loose materials and for certain kinds of excavation.

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Hayward Multi-Power Orange Peel Bucket. This bucket, fitted with a two part side chain has double closing power. The power wheel is of sufficient width in the score to accommodate the additional amount of closing line required.

This bucket is used in the very hardest digging jobs, such as work in clay, and compact sand.

Hayward Class K Clam Shell Bucket, which permits three, five and seven part line reeving, and thus can be changed to meet practically every digging and handling requirement from light fast rehandling to hard digging.

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Every bucket shown on this page is described more fully and illustrated in action in one of the bulletins displayed below, which will be sent you on request.

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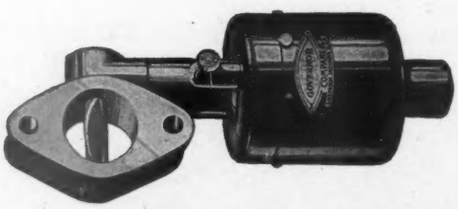

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1 -inch openings change to 1¼ or 1½ inch
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This feature, exclusive with the Robins CATARACT Grizzly, appeals to crushed stone producers. It makes the flowsheet more flexible.

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Fifth—A minimum of space is occupied by this Grizzly.

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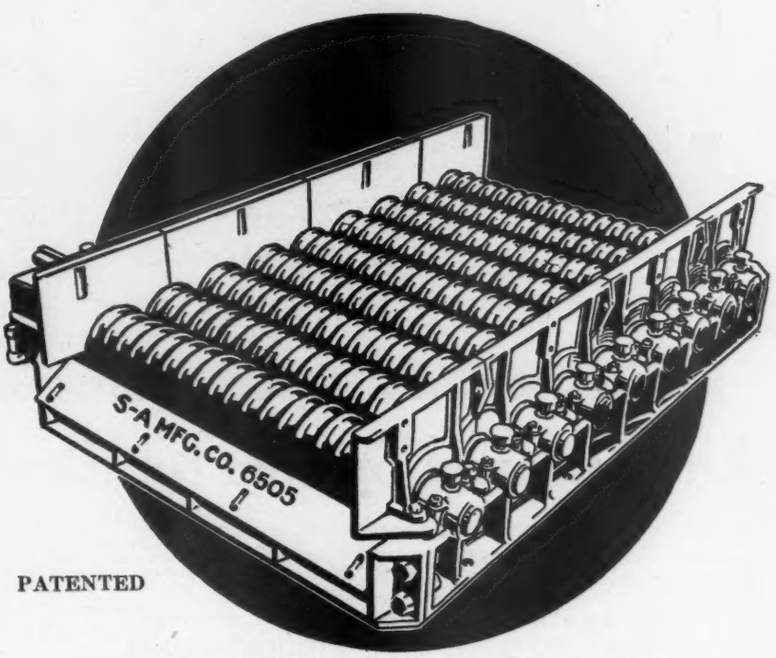

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This is the S-A "Live Roll Grizzly" which created so much interest at the Detroit convention of the National Sand and Gravel Association, January 4, 5 and 6.

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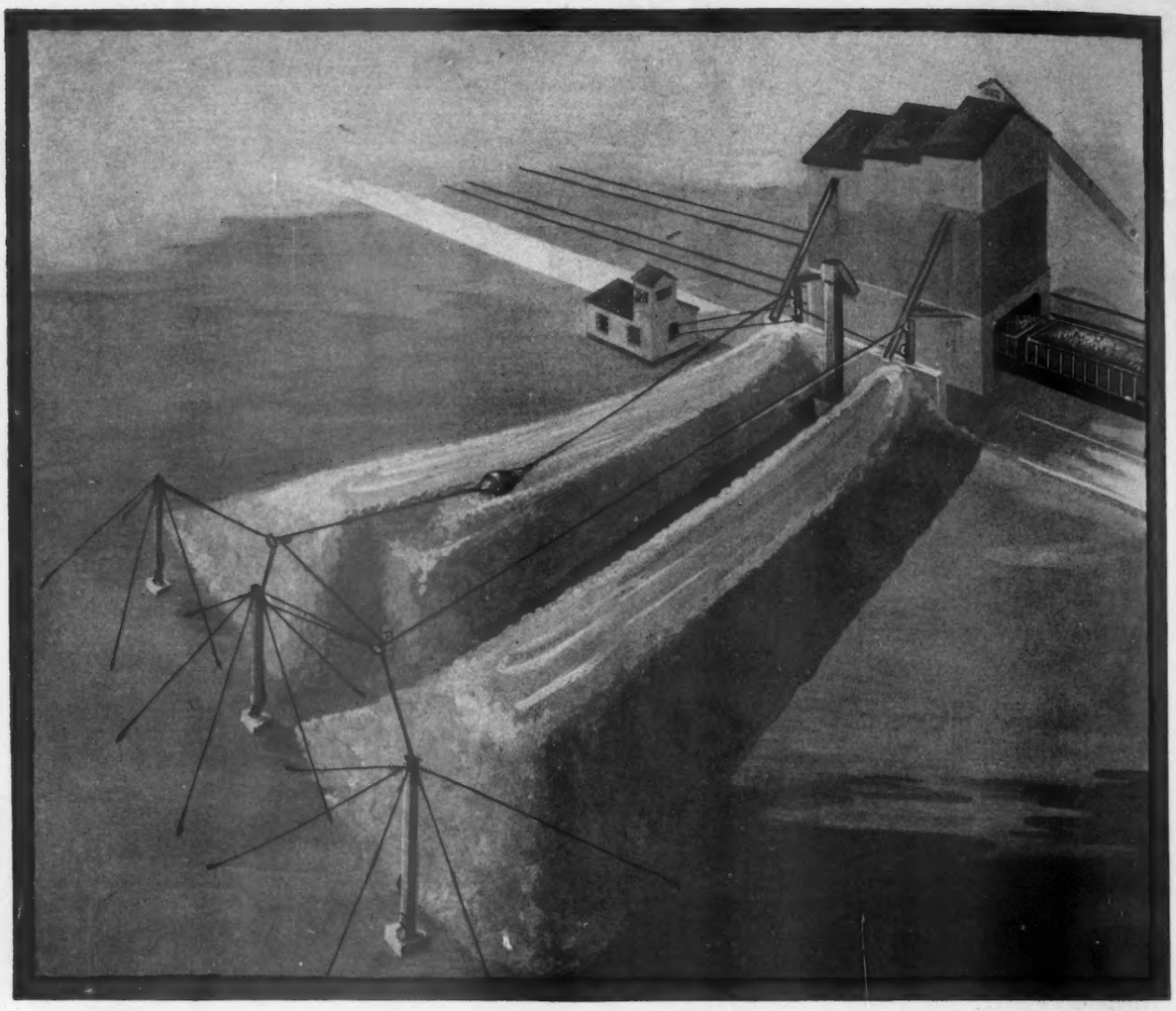

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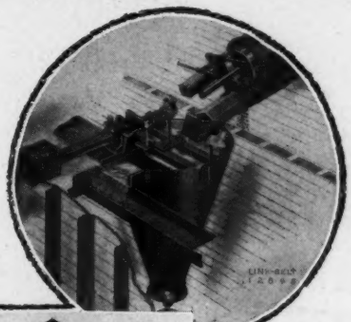

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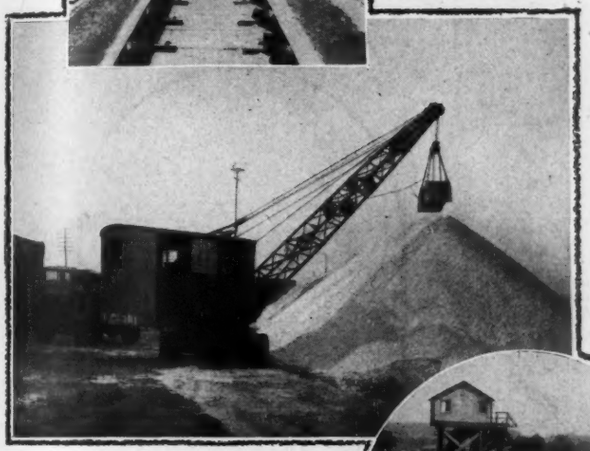

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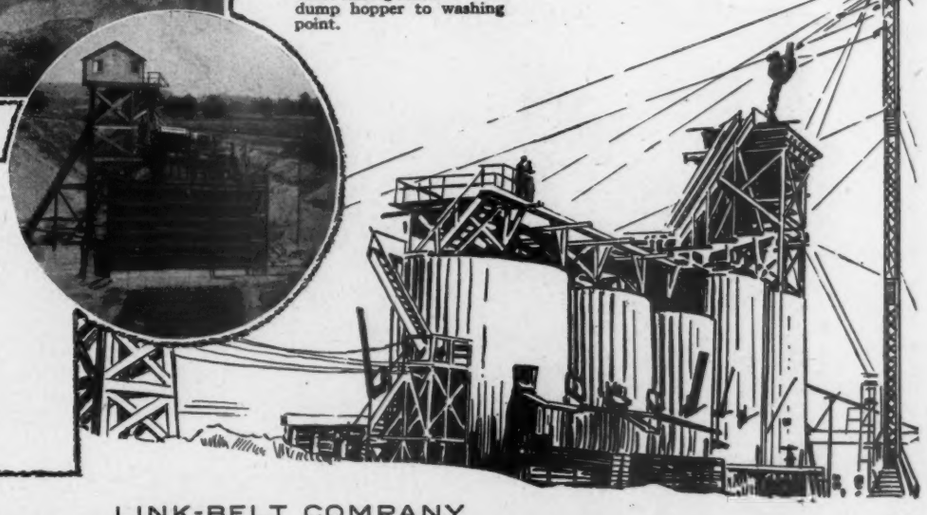

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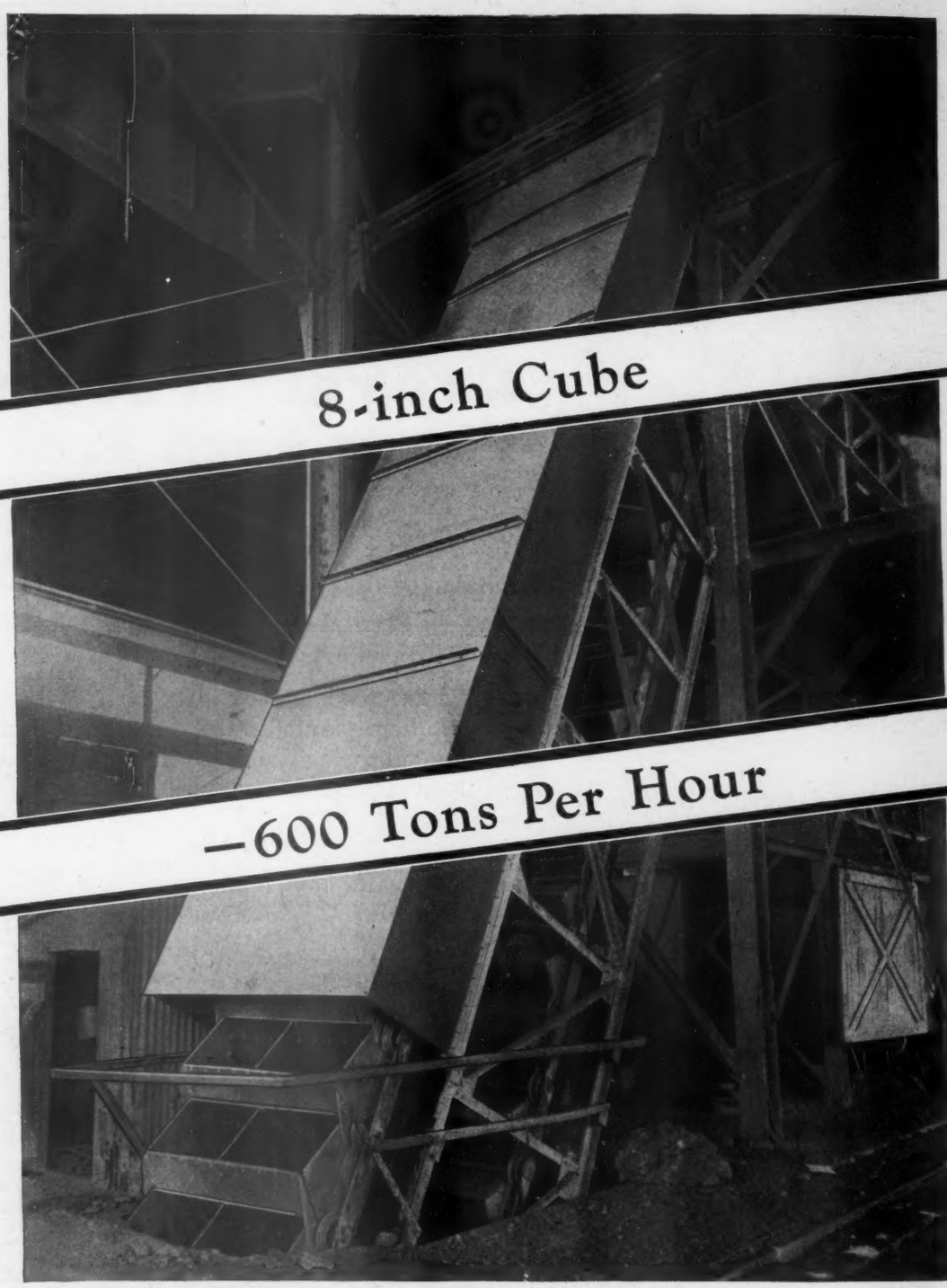

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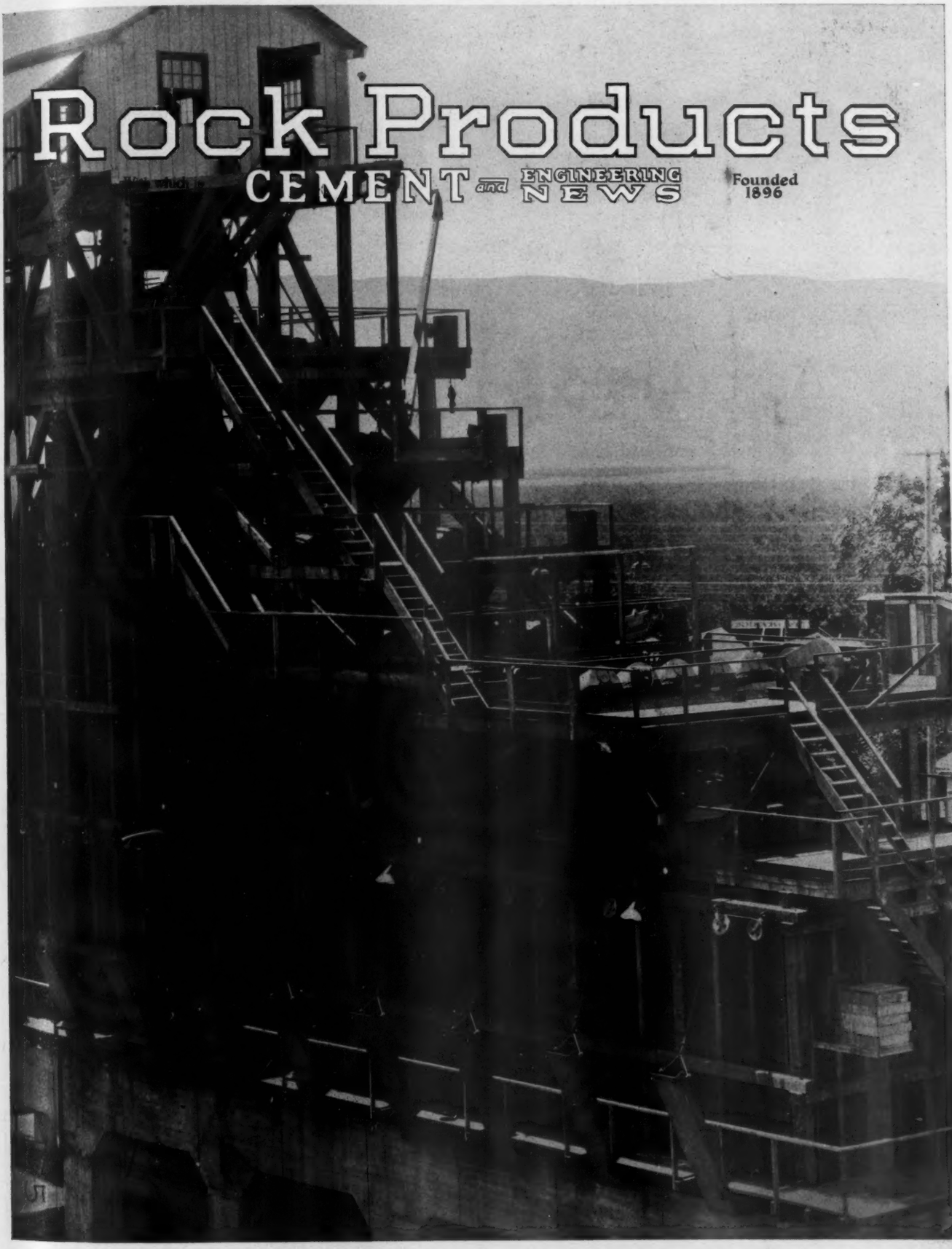
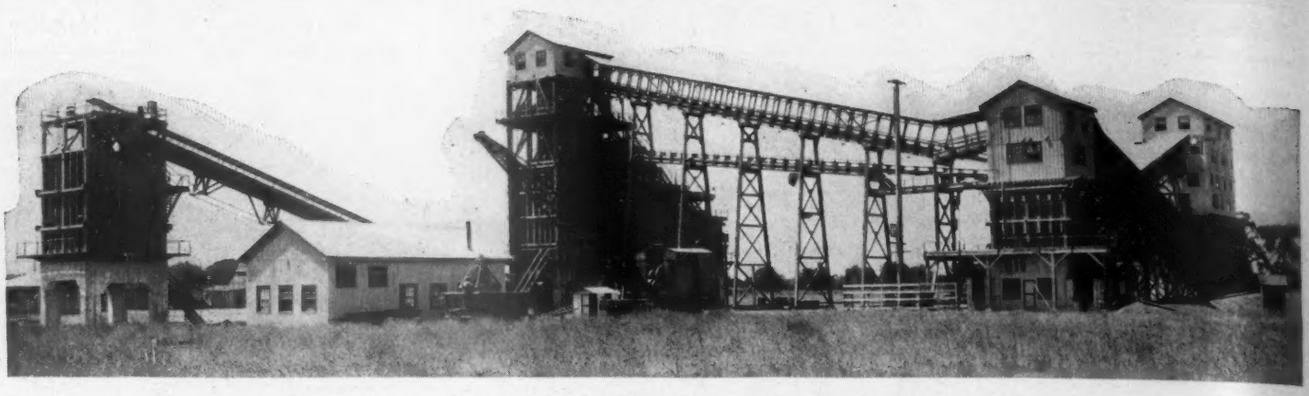


Gravel washing plant and loading bins of the Coyote, Calif., plant of the Associated Gravel Co.



General view of the Coyote, Calif., plant of the Associated Gravel Co.

New Coyote, Calif. Plant of the Associated Gravel Company

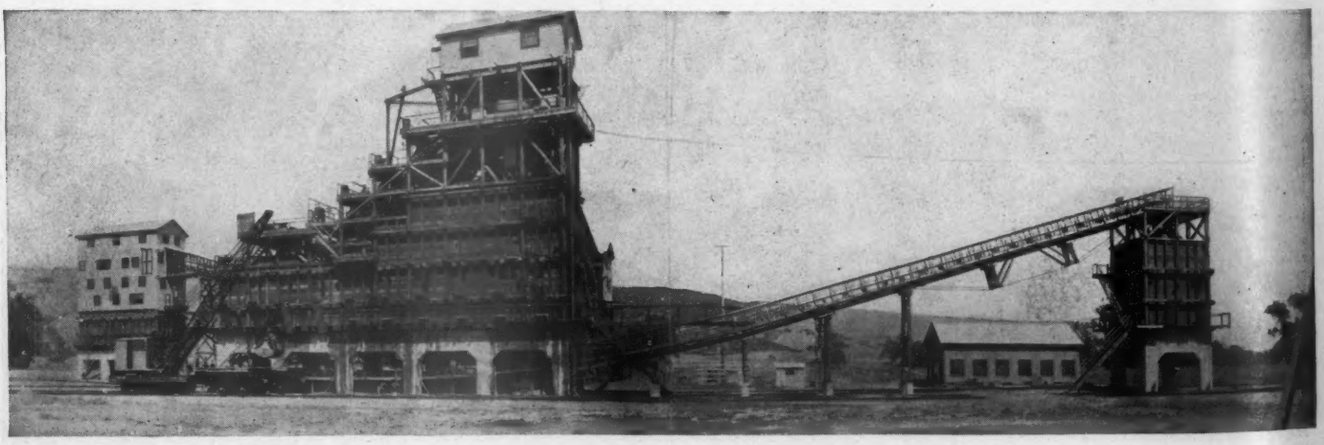
Crushed Stone and Sand and Gravel Produced from the Same Deposit

By Gordon Smith
J. C. Buckbee and Co., Engineers, Chicago

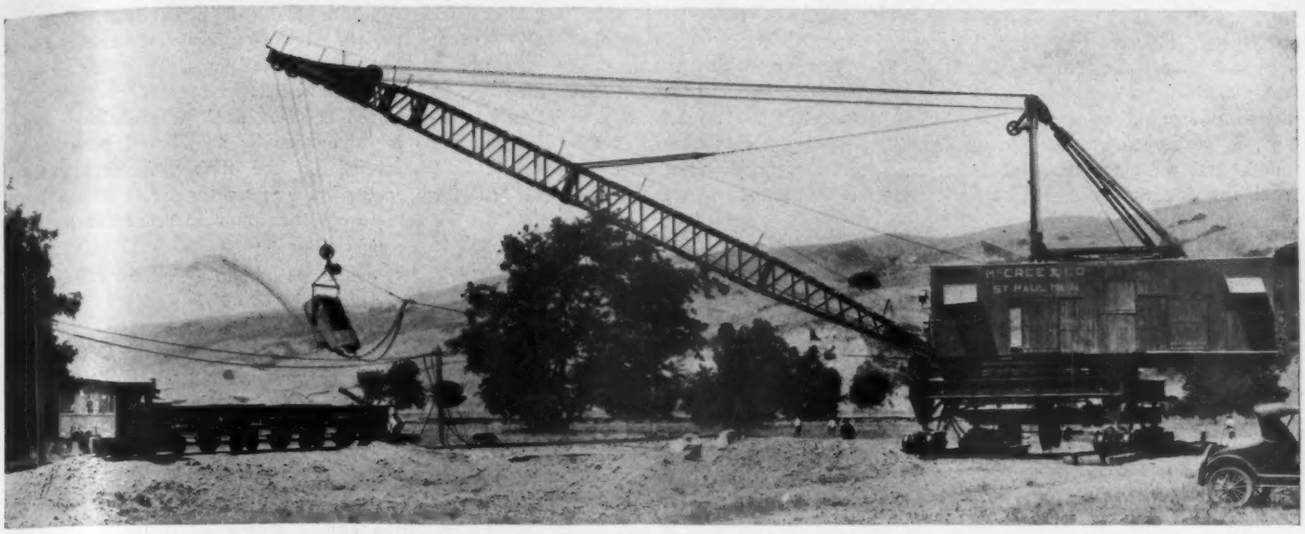
IT is neither usual nor customary, in the Middle West at least, to find a crushed stone plant with dry screening equipment, and a sand and gravel washing plant operating from the same deposit. On the other hand, this sort of procedure is fairly common in California, as shown in the plants around Los Angeles and those of the Associated Gravel Co. in the vicinity of San Francisco. This company, but newly called into existence, took over the properties of the Niles Sand, Gravel and Rock Co., the River Rock Gravel Co., the Riverbank Gravel Co. and the newly completed plant of the Coyote Gravel Co., all of which were owned and controlled by William H. Ford. These four companies transferred their properties to the new company, which will operate under the same ownership.

Mr. Ford is one of the pioneer producers and marketers of concrete aggregates in the San Francisco district and is now the president and guiding spirit of the consolidation. Early in 1924 he acquired the deposit near Coyote, Santa Clara County, California, on the Southern Pacific Lines, and began its development in behalf of the Coyote Gravel Co. The location is about two miles south of the village of Coyote, and 61 miles south of San Francisco. The property comprises over 250 acres of river bottom lands, all of which is underlaid with an excellent deposit of sand and gravel with but little or no stripping. The deposit is in some respects almost self-perpetuating, inasmuch as the freshets and floods every year replace much of the material previously excavated from the river bed. Except for these times of high water, when the little stream overflows its flat and wide-spreading banks, the excavation from the pit is dry. The gravel extends to a depth of over 100 ft. and averages 35 to 40% sand, with boulders around 8 to 10 in.

The property comprises chiefly farm and bottom lands and adjoins a concrete highway, on the other side of which are the tracks of the railway. Although the development of the project and the plans for the plant were started and prepared in 1924 and 1925, the actual construction was delayed, due to difficulties incident to the obtaining of trackage rights across the highway and other such matters, so that the plant was not constructed until the fall of 1926 and was placed in commission in the spring of 1927.



Washing plant, mixing conveyor and mixed materials loading bins

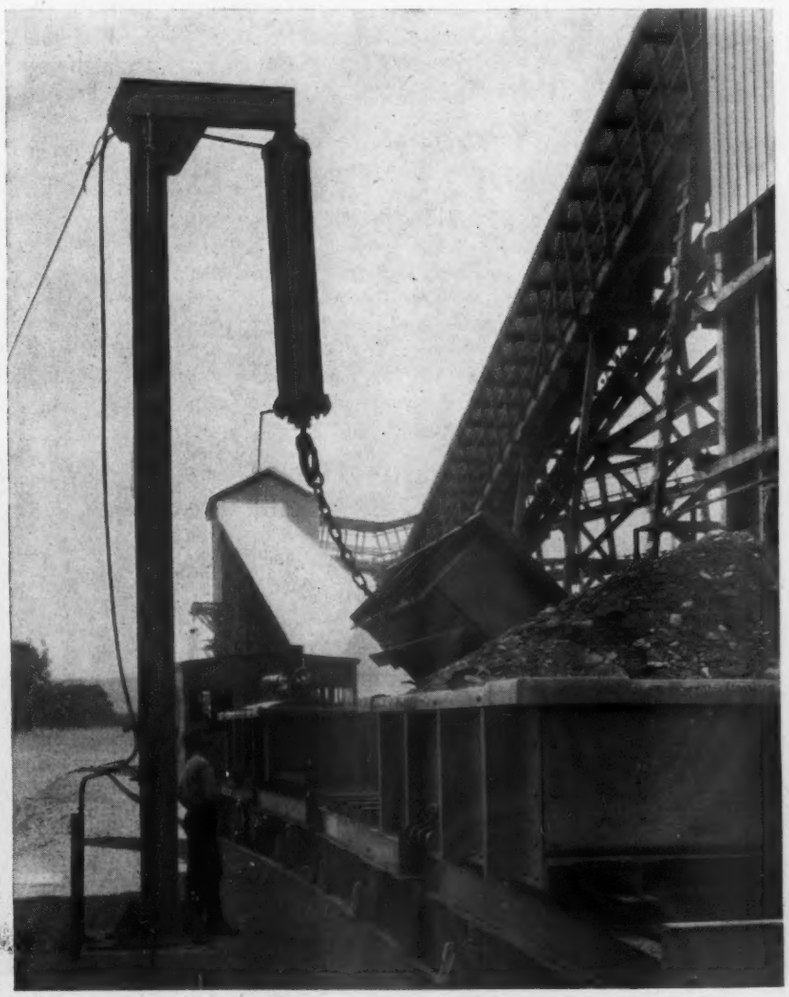


Electric dragline with 100-ft. boom and 3½-yd. bucket excavating raw material

A siding from the Southern Pacific railroad crosses the highway at one corner of the property and bends around at an easy curve to the loading bins of the washing plant and the dry screening plant. A considerable yard for the handling of loaded and empty cars has been built, and the track arrangement provides as well for a ground storage in keeping with the output of the plant. All material passing through the plant storage yard is handled with a 25-ton gasoline driven Ohio locomotive crane, which also assists in switching cars.

The raw material is excavated by a Bucyrus Class 24 electric dragline excavator with 100-ft. boom and 3½-yd. dipper. This machine takes current at 2300 volts from the substation through a three-conductor flexible armored cable. The material is loaded into 8-yd., standard gage, all-steel Easton "Won Way" type quarry cars and hauled to the plant by a 14-ton Whitcomb gasoline locomotive, equipped with a 135-hp. six-cylinder Climax engine, similar to that on the crane. The pit equipment and the method of dumping the quarry cars at the hopper are well shown by the accompanying cuts. The air hoist has a 14-in. diameter cylinder with 6 ft. 9 in. stroke, and is served by a 4x4-in. Ingersoll-Rand compressor, electric motor driven.

The receiving hopper, of reinforced concrete, of course, with a steel bar grillage over the top to protect the feeder and belt beneath from damage due to large stones, is located alongside the dry screening plant. The purpose of this location will be pointed out later on. This hopper is 12 ft. by 16 ft. in plan, 7 ft. deep and has a live capacity of about 50 tons. Beneath the hopper is a 30-in. by 60-in. reciprocating plate feeder run from the tail pulley of the 30-in. main conveyor which it serves. This conveyor, which is 227 ft. centers and inclined at 3 in. in 12 in. from the horizontal, delivers the pit run material to the bar grizzly at the crushing plant. Here a rough separation is made at about 3 in. The oversize material goes to two No. 5 Gates, style K, gyratory crushers and thence to a 24-in. inclined conveyor to the dry or crushed stone plant.



Car dump at the receiving hopper

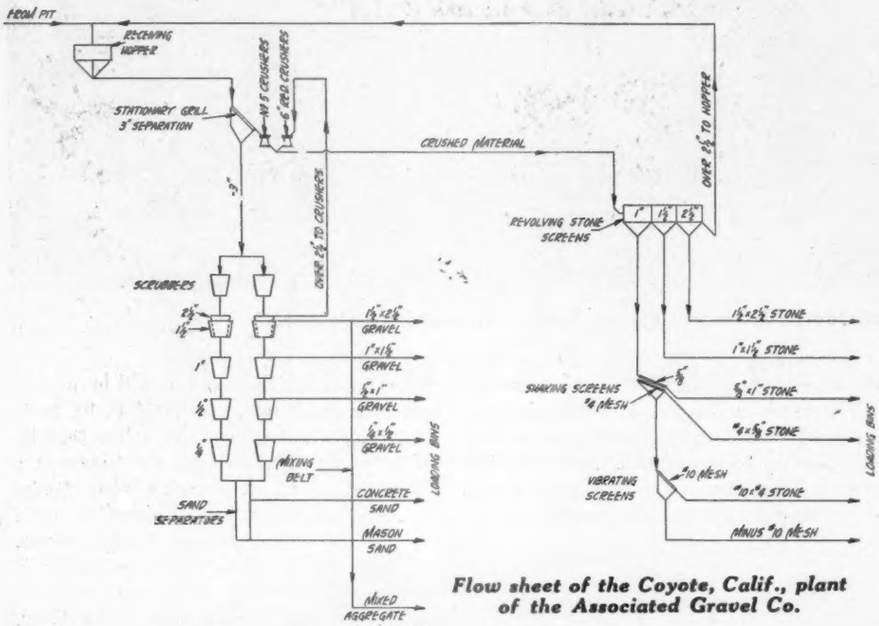
The material below 3 in. in size and passing through this bar grizzly passes to a second 30-in. inclined belt at right angles to the first, and running to the top of the sand and gravel washing plant.

In the design of this plant, the engineers were faced with the problem of ridding the material of a considerable quantity of leaves, twigs and other floating material, carried down by the river and mixed in with the deposit. They accordingly had to provide means for the elimination of such material and, after a considerable study, designed a pair of special conical scrubbers. These con-

sist of conical steel drums carried on 8-in. shafts and resembling in general appearance the familiar and conventional conical gravel screens, but with solid plates instead of perforated metal. Inside, however, is a series of lifter angles which tumble and wash the material and free it from the floating twigs or leaves. These same lifters, at the large end, carry the washed material up and discharge into the steel feed spouts leading to the first bank of sizing screens. The entire scrubbers revolve in a steel housing, wherein the water level stands only about 6 in. below the center of the scrubber shells, thus permitting the debris to float out of the scrubbers and over the weir at the discharge end.

As might be expected, a considerable quantity of sand is carried out of the scrubbers by the dirty water. To meet this condition, there were built into the tanks surrounding the scrubbers sand settling chambers with variable spigot openings at the bottoms. In these tanks the sand is caught and carried directly to the sand washing and sizing apparatus following the last pair of revolving screens.

As noted above, the discharge of the scrubbers is caught in a steel spout and carried to the first pair of 48-in. by 65-in. by 78-in. double shell sizing and washing screens, having 2½-in. perforations in the inner shells with 1½-in perforations in the outer shells. These screens are followed by three more pairs of similar single shell screens of the same size and having 1-in, ½-in. and ¼-in. perforations, respectively. All perforations are round holes. The oversize from the first pair of screens is returned to the crushing plant on a 24-in. conveyor and put through two 6-in. Superior McCully reduction crushers, the crushed material going to the dry screening plant on the 24-in. inclined conveyor mentioned before. Each of the sizing screens is surrounded by an all-steel plate housing carried on the timber framing and the spouts between screens are of similar heavy plate construction with renewable liners.



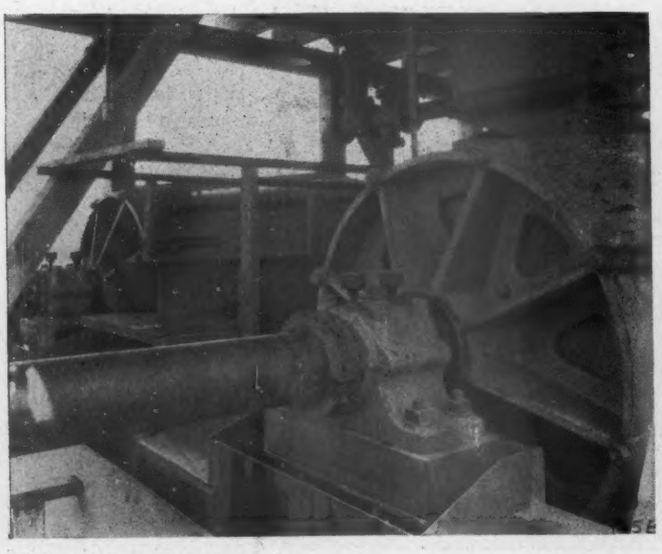
Flow sheet of the Coyote, Calif., plant of the Associated Gravel Co.

The material passing the final pair of screens is caught in a timber settling chamber served by five 16-in. inclined double flight screw conveyors. The settling chamber is divided into three compartments. The stream of water and sand is fed into the central compartment which is served by three of the screws. Here the screws wash and dewater the coarser sand of "concrete" grade. The overflow from this central compartment passes over adjustable weir boards into the two outside chambers of the settling box, each served by one screw which washes and dewaters the finer sand which is of "mason's" or "plaster" grade. The dirty water overflow from the secondary or fine sand compartments now joins with the dirty water from the scrubbers and is wasted.

The waste flume does not run out overhead from the plant as is customary but runs down the side end of the plant, thence under the tracks and away. This method of handling the waste water does away with the necessity of crossing the loading tracks, thus interfering with crane clearances.

The washing plant bins are of timber construction, stud, binder and plank design, and comprise six pockets, with segmental type gates with hinged spouts for car loading. The timber bin structure is placed on a concrete sub-structure, with a through drive under the bins and bottom bin gates for truck loading.

Underneath the bins and occupying a narrow space alongside the truck driveway is a 24-in. wide mixing belt of 224 ft. centers. This belt is horizontal underneath the



Special conical scrubbers of heavy steel construction and housing

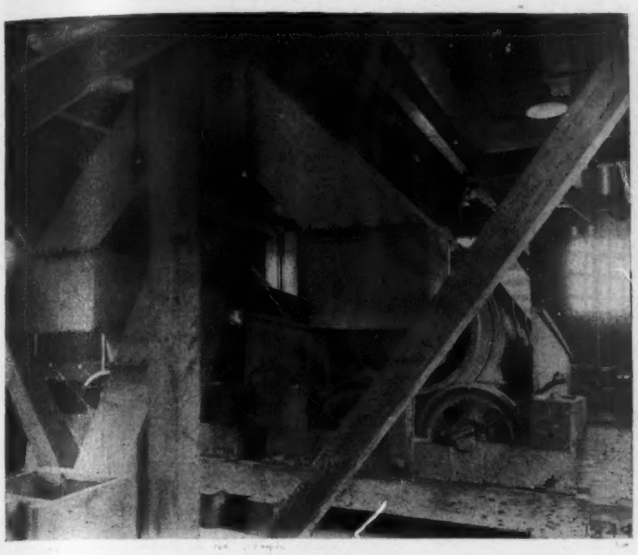
Conical scrubbers and first pair of gravel sizing screens

bins and rises on a gentle curve at one end to a 4-in. in 12-in. incline leading to a separate loading bin structure of similar construction, about 140 ft. away. This belt is used to handle plant mixed materials which are delivered to either of two pockets in the loading bins mentioned. Underneath each of the plant bins is a 21-in. by 54-in. reciprocating plate feeder delivering to the mixing belt. These feeders are all interconnected and driven by a crank motion from a central drive unit consisting of a 15-hp. motor, silent chain drive and Link-Belt herringbone gear reducer. The stroke of each feeder may be varied from zero to six inches and a vertical slide gate is provided to vary the depth of material carried on the feeder plate. In such manner, a closely controlled mixture of any of the six sizes of material made in the washing plant, in any desired volumetric proportion may be obtained. The adjusting means is very simple and readily controllable, the arrangement being such that the proportions may be varied while the feeders are in operation. These feeders, like the scrubbers, were designed especially for this plant by the engineers.

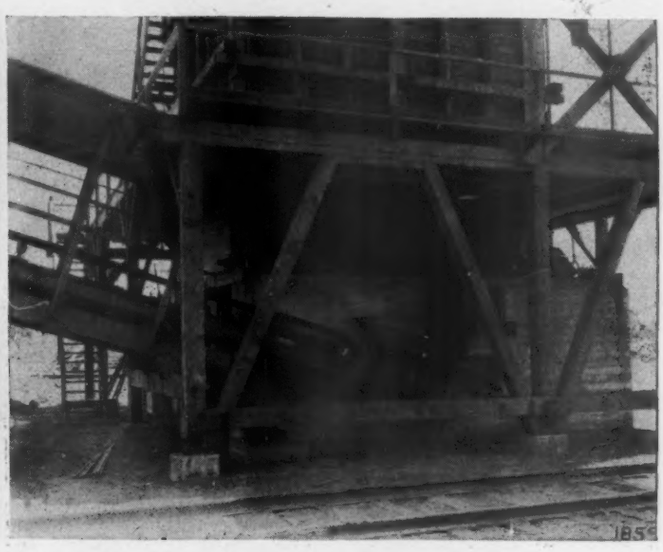
To return now to the crushed stone part of the operation. The crusher product, as noted before, is carried to the dry screening plant on a 24-in. inclined conveyor of about 230 ft. centers. Here two 48-in. by 20-in revolving stone screens make 2½-in. by 1½-in., 1½-in. by 1-in. and minus 1-in. stone. The material passing through the 1-in. perforations is fed to two 4-ft. by 10-ft. Allis-Chalmers compensated type, double deck shaking screens having ⅝-in. and No. 4 mesh perforations. The fine material through the lower deck is fed to two Link-Belt vibrators having a single deck with 10 mesh perforations.

The stone bins are of stud, binder and plank construction similar to the washing plant bins, and are six in number. The bins are built over a concrete substructure, similar to the washing bins, which forms a tunnel for truck loading through bottom bin gates. But a single loading track passes the stone bins, the plant receiving hopper being on the other side. By this arrangement, any size stone may be by-passed from the dry screening plant back to the washing plant or the entire feed to this plant may be sent back.

Water for washing purposes is supplied from wells on the property and pumped to the plant by a six-stage Byron Jackson deep well pump, driven by a 100-hp. motor. The pump delivers about 1200 gallons per minute at 180 ft. head. The water piping to the various screens and scrubbers is generously proportioned to insure ample delivery at uniformly high head for washing purposes. The loading spouts on the bin gates are furnished with individual rinsing



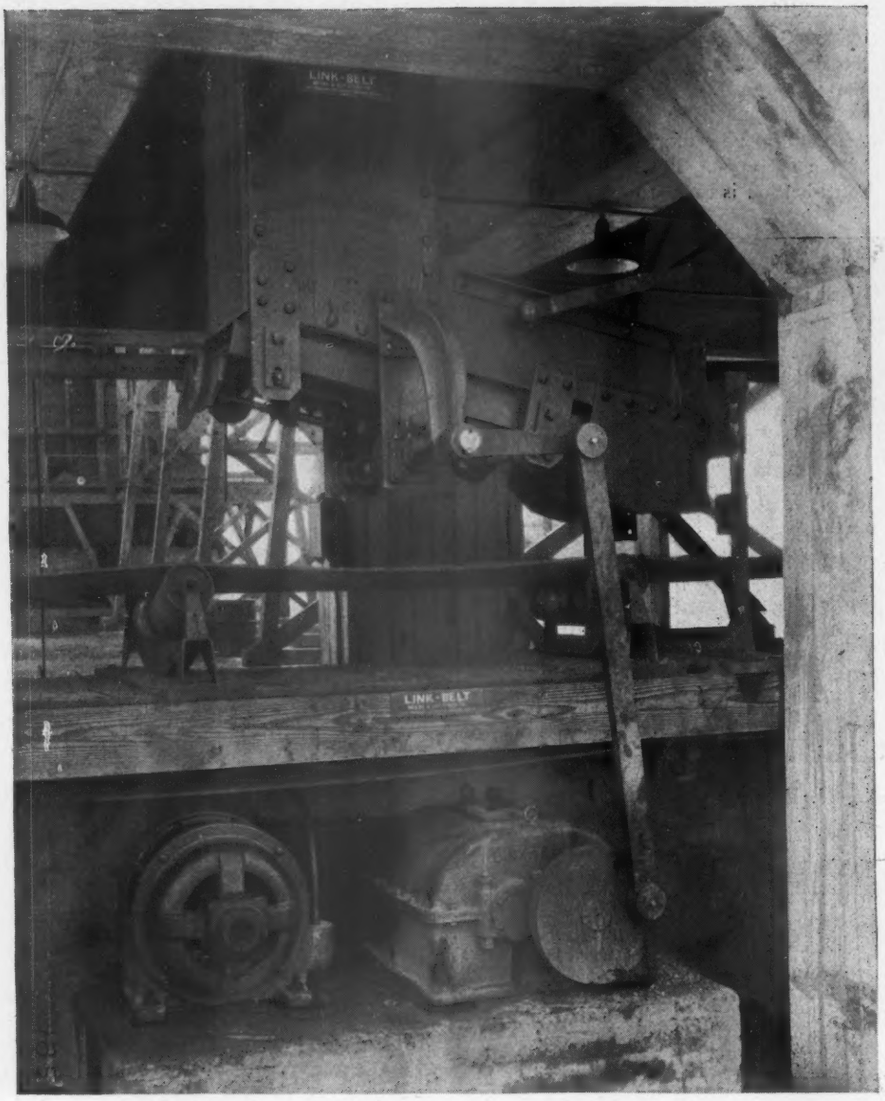
Stone screens from the feed end showing the by-pass chute and gate



Crushing plant showing two of the gyratory crushers and incline conveyor to dry screening plant

Double-deck shaker screens in the dry screening plant

Vibrating screens for preparing finer sizes of stone



Drive machinery for feeders over the mixing belt

nozzles, and the gravel gate spouts have a perforated plate in them to give the material a final rinsing as it goes into the cars. Mr. Ford has ever been a stickler for clean materials and has gone to great pains to maintain this enviable reputation.

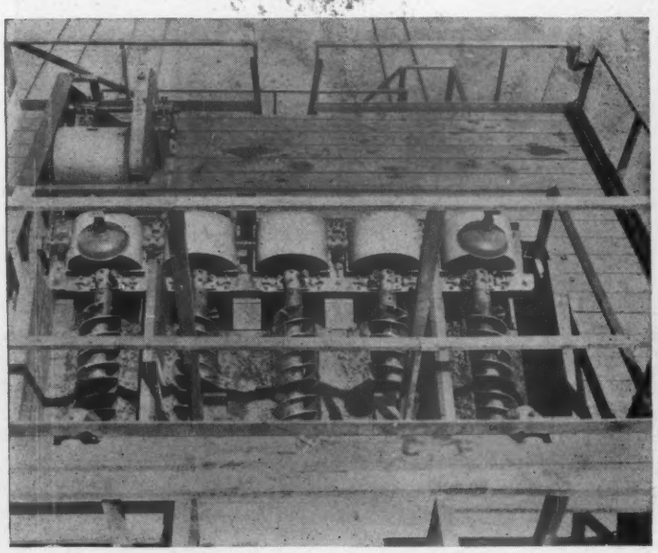
The plant is motor driven throughout. Power is brought to the property by an overhead 4000-volt line, terminating in a transformer station, wherein the voltage is reduced to 440 volts for the plant and 2300 volts for the excavator. Feeders from the substation to the plant motors are carried underground in conduits to distribution centers and thence in conduits to the individual motors and their starting apparatus. General Electric motors are used throughout.

The 30-in. conveyor from the receiving hopper to the crusher plant is driven by a 40-hp. motor through a silent chain drive and spur gears. This same motor also drives the 24-in. return conveyor from the washing plant, from the head shaft of the 30-in. conveyor through bevel gearing and sprocket chain. The 30-in. conveyor from the crusher plant to the washing plant is driven by a 75-hp. motor through a silent chain drive and spur gearing. From the head shaft of this conveyor, sprocket chains drive the scrubbers and washing and sizing screens. The scrubbers are driven through jaw clutches so that they may be by-passed when running in clean material, requiring no preliminary scrubbing. The sand screws are driven by a 20-hp. motor through a silent chain drive to a common countershaft and individual bevel gears.

The mixing belt is driven by a 20-hp. motor, with silent chain drive and spur gears similar to those used on the other conveyors. The 24-in. belt to the dry screening plant and the revolving screens are driven by a 60-hp. motor through a silent chain drive and sprocket chains to the screen countershafts. The shaking screens and vibrating screens are individually motored and belt driven.

The four crushers are all driven by individual motors of 50-hp. each, belted to clutch pulleys on the crusher shafts.

The plant throughout has been designed with the utmost of flexibility in view, consistent with economy of first cost and oper-



Battery of screw washers in wet plant

Mixing belt and feeders under the gravel bins

ating expense. The crushers are all preceded by feed bins of generous proportions so that they may be run at maximum capacity and efficiency. The feed to the crushers is further so arranged that all may go to the No. 5's or to the reduction crushers, and the feed spouts to the revolving screens in the dry screening plant from the conveyor carrying the crushed material, are provided with gates so that such material may be, in whole or in part, by-passed around the dry screening plant and returned to the hopper and thence through the washing plant.

The plant structures are of concrete and structural timber as described. The conveyor galleries are roofed but not totally enclosed. The washing plant is of open construction, except the motor platform at the head of the main conveyor. The dry screening plant is enclosed with corrugated iron roofing and siding on timber studs, amply provided with windows for light and ventilation. A glance at the illustrations will disclose that the plant is well lighted artificially for night operations. Comfortably wide stairways, not too steep, are provided for access to all portions of the plant buildings and all working platforms are well guarded by substantial timber hand rails.

A machine shop, 25 ft. by 45 ft. in plan, of light frame construction is provided for ordinary maintenance work and is equipped with a 16-in. lathe, 20-in. drill press, hack saw, grinder and blacksmith forge. One end of the shop is blocked off as a storeroom, with space adjoining for employees' lockers.

Alongside the roadway leading to the loading bins from the highway are located the plant offices and a two-car garage. The former is a low building of attractive appearance with wide overhanging eaves, 25 ft. square and of frame construction. The building is well lighted and airy, containing a general office, a private office and two sleeping rooms, with toilet and showers.

Plant offices and garage

The J. C. Buckbee Co., engineers, of Chicago, was in complete charge of all engineering work and design in connection with this plant, including all details of the structure as well as the machinery utilized, much of which was of special design to fit the particular needs of this plant. This company has served the predecessor companies and Mr. Ford for many years as consulting engineer.

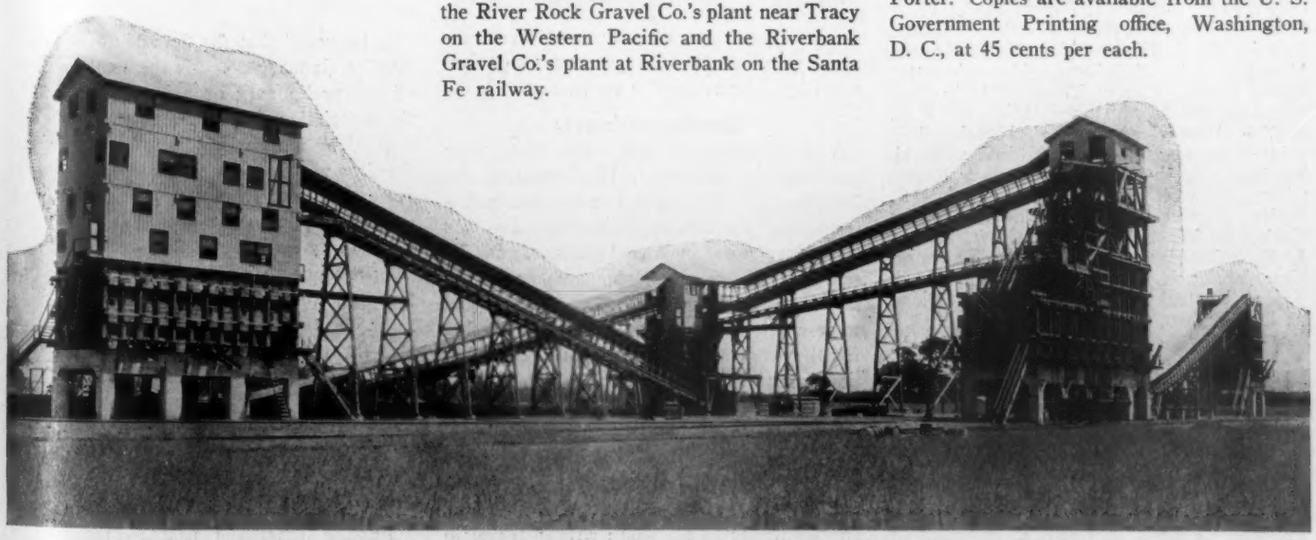
The Allis-Chalmers Co. furnished the crushers, revolving stone screens and shaker screens. The General Electric Co. furnished the motors and the Link-Belt Meese and Gottfried Co. the conveying machinery, gravel screens, scrubbers, feeders, vibrating screens, loading gates, etc.

William H. Ford is president and general manager of the Associated Gravel Co., with offices in San Francisco. The Associated Gravel Co., in addition to the plant described, owns and operates the Niles Sand, Gravel and Rock Co.'s plant at Niles, Calif., on the Southern Pacific and Western Pacific Lines, the River Rock Gravel Co.'s plant near Tracy on the Western Pacific and the Riverbank Gravel Co.'s plant at Riverbank on the Santa Fe railway.

Manufacture of Lime

THE Department of Commerce has recently brought out Circular of the Bureau of Standards No. 337 on the manufacture of lime. This bulletin is a revised edition of paper No. 16 published in 1913 and contains much information on the methods and operation processes of typical lime plants situated in different geological belts. The appendix gives a description of nine such plants visited by field representatives in 1925.

The technology of lime manufacture has made considerable advance since 1913, the date of the publication of the first bulletin by the bureau, hence the descriptions of present-day methods and equipment included in the new bulletin should be of exceeding interest to all lime manufacturers. The new standard specifications for quicklime and hydrated lime and revised methods of testing are presented complete in the new and enlarged edition which was revised by J. M. Porter. Copies are available from the U. S. Government Printing office, Washington, D. C., at 45 cents per each.



Relative positions of the crushed stone plant (left) and gravel washing plant (right) with conveyors and primary crushing plant (center)

Crushed Stone Association Holds Its Most Successful Convention

Proceedings and Abstracts of Papers Presented at Eleventh Annual Meeting—Attendance at West Baden, Ind., Sets New High Record

THE eleventh annual convention of the National Crushed Stone Association, which closed its sessions at West Baden, Ind., January 19, was the best attended in the association's history. The manufacturers' division also held the largest exhibit, and the social features of the convention in part provided by the Indiana producers surpassed those of former years. Especial note should be made of the program for the entertainment of the ladies which was in charge of Mrs. Grace M. Evans, an active member of the Monon Crushed Stone Co., Lafayette, Ind., not to mention here various other features provided for both ladies and gentlemen by the chairman of the entertainment committee, R. Brink Tyler, Louisville, Ky.

The nominating committee succeeded in persuading Otho M. Graves, of the General Crushed Stone Co., to remain in the president's chair for another year. The other officers and directors elected were:

Regional Vice-Presidents: Mortimer Wandell (Eastern), New York; Allen Patterson (Central), Ohio; T. I. Weston (Southern), South Carolina; W. F. Wise (Southwestern), Texas; W. R. Sanborn (Northern), Illinois; A. R. Wilson (Western), California; C. M. Doolittle (Canadian), Canada.

Directors: W. M. Andrews, Ohio; H. E. Bair, Ohio; A. J. Blair, Wisconsin; W. W. Boxley, Virginia; C. D. Brewer, Minnesota; L. R. Cartwright, Indiana; O. P. Chamberlain, Illinois; J. E. Cushing, New York; W. Scott Eames, Connecticut; E. E. Evans, Ohio; F. O. Earnshaw, Pennsylvania; F. T. Gucker, Pennsylvania; W. P. Hodgkins, Illinois; J. C. King, Ohio; E. J. Krause, Missouri; A. S. Lane, Massachusetts; Harry Landa, Texas; Thomas McCroskey, Tennessee; R. N. McDowell, Missouri; F. C. McKee, Pennsylvania; F. C. Murphy, Illinois; Stuyvesant Peabody, Illinois; E. U. Ragland, North Carolina; Russell Rarey, Ohio; John Rice, Pennsylvania; H. E. Rodes, Tennessee; James Savage, New York; F. W. Schmidt, Jr., New Jersey; J. F. Schroeder, Iowa; W. L. Sporborg, New York; J. W. Stull, Virginia; R. B. Tyler, Kentucky; G. J. Whelan, Ohio; A. L. Worthen, Connecticut.

From the Manufacturers' Division: C. B. Andrews, New Jersey; M. B. Garber, Ohio, and F. G. Lewis, New York.

J. R. Boyd was retained as secretary and James Savage as treasurer for the year 1928.

The financial condition of the association is the best it ever was. It had an income of nearly $50,000 in 1927. During the year President Graves devoted a considerable part of his time and energies to raising a fund to equip and maintain a laboratory. Receipts prior to the convention were about $13,865. During the convention cash and pledges to the extent of nearly $10,000 more were received, making a total of between $22,000 and $23,000. The two largest contributors were Arthur S. Lane, John S. Lane & Son, Inc., Meriden, Conn., and W. L. Sporborg, Rock-Cut Stone Co., Syracuse, N. Y., each of whom gave $2000 in a personal way, in addition to generous contributions by their respective companies.

Otho M. Graves, re-elected president, National Crushed Stone Association

Opening Addresses

The members of the convention were welcomed by ***Albert J. Wedeking*** of the Indiana State Highway Commission and a member of the Indiana legislature. His talk was largely of Indiana highways, and he said that the state had about 5000 miles of improved road which had furnished and were continuing to furnish a broad market for the product the members of the association had to sell.

Indiana's highways are of importance to more people than those who live in the state, as they are an important part of the great east and west highway system. The lakes to the north and the hills of West Virginia and Kentucky to the south compel travel to cross Indiana. Tourists, he said, find many things to interest them in the state, notably the system of state parks by which the historical and interesting localities in the state were being preserved and cared for.

L. R. Cartwright, vice-president of the Midwest Crushed Stone Co. of Indianapolis, Ind., replied to the address of welcome for the association. He said it was fitting that a stone association should hold its convention in what is perhaps the most famous limestone district in the world, referring, of course, to the great cut-stone industry about Bedford that sends its product to every state in the Union and to foreign countries. Then he touched upon Indiana's recent political troubles and said that in spite of these the state had an excellent highway system and other advantages for which other states were running in debt, and yet the state of Indiana did not owe a dollar and had $18,000,000 in the treasury. "If we could do all that with dishonest politicians, what couldn't we do if you would send us some of your honest politicians to run our government?" he asked. The convention acknowledged this with applause.

The presidential address of ***Otho M. Graves*** was somewhat more informal than his talks have been in previous years. He began with a classical allusion, a description of the gate on the highway to Olympus with the guides, one looking forward and the other backward, and he said he wanted to follow each a little way, going backward for experience and forward for the application of experience.

It happened that the first day of this convention, January 16, was the tenth birthday of the preliminary organization meeting of the association at Columbus, Ohio, and President Graves mentioned this and described the first meeting at Columbus when crushed stone producers from Ohio, Indiana, Illinois and Wisconsin gathered to start the movement for a national association. The Chicago producers who attended were on a train that was caught in a blizzard and did not get to Columbus until late that afternoon. But the meeting was held and the association launched and it has met with more and more success each year as the attendance at this eleventh annual convention attested. A. J. Blair, of the Lake Shore Sand and Stone Co., Milwaukee, Wis., who was the first president chosen, was present.

Passing from the past to the present, President Graves told how the problems of an earlier day had been superseded by prob-

lems of an altogether different nature, now that research is the backbone of present day business, for it is foolish to think that any manufacturing process will continue unchanged or that the market for any product will remain stable. He gave some well-known instances to prove this, such as the effect of radio on the phonograph and piano trades. It is research that enables an industry to adapt itself to the changes in methods and markets and research can even go farther and cause the market itself to change and expand.

He felt at first that a laboratory would never be needed by the research department, as people would look on any of its findings as propaganda. But the association is passing through an evolutionary period, and A. T. Goldbeck, the director of research, now has such a reputation among engineers and scientific men that they would all have confidence in anything that he would publish, and accept it without question.

Experience is showing daily that the association cannot depend on other agencies to secure the facts needed to safeguard the place of crushed stone in construction; the association must develop such data itself in its own laboratory, President Graves said.

The association had (when Mr. Graves spoke) about $18,000 in its laboratory fund and wanted $25,000. Subscriptions were coming in and it was to be hoped that the full amount needed would be subscribed before the convention ended. Enough was in sight, he said, to be sure that a laboratory would be established, but the kind of a laboratory really needed for all the work in prospect would cost from $25,000 to $30,000, so it was desired that some such sum be raised at this time.

Reviewing other work of the association, President Graves spoke of the many contacts with engineering and professional associations, such as the American Society of Testing Materials and the National Research Council, in which the public good was the only thing sought, with whatever advantage that the association might gain as a mere by-product. Yet even this work had developed an increased market for crushed stone.

During the year the association has gained 24 active members with 354 memberships of $25 each. This brings the total to 1296 full memberships.

President Graves thanked the board of directors and the executive committee for their splendid co-operation during the year. Twenty-two directors had attended the Atlantic City meeting in October, evidence enough of the willingness of these men to leave their business at an especially active time of the year to do the association's work. And the executive committee had been so faithful that in the last three meetings there had been but four absences out of a possible 21.

The Manufacturers' Division, President Graves said, had been as quick if not quicker than the producers to realize what the association was working for, and they had shown this by the way they were raising $5000 for the laboratory fund.

In concluding he thanked the entertainment committee for the way it had handled an unusually difficult task, since a much greater amount of detail work was required to entertain a convention where the resources of a big city could not be drawn upon. He especially thanked R. Brink Tyler, the chairman of this committee, and also Mrs. Grace M. Evans, who had brought the ladies to this opening meeting and who had taken charge of their entertainment during the convention.

A. T. Goldbeck, director, bureau of engineering, N. C. S. A.

President Graves called on A. R. Wilson, one of the regional vice-presidents, who had come from California to attend the convention, and Mr. Wilson responded with a few words. Some of the new members and others were also asked to rise and be introduced to the membership.

After the announcement of the various committees, President Graves called for the reports of the directors on conditions and prospects of the industry in the localities which they represented.

Reports of Directors

W. M. Andrews, Carbon Limestone Co., Youngstown, Ohio, reporting for western Pennsylvania, said:

"It is with regret that I must sound a pessimistic note after so much optimism, but as the experience of the western Pennsylvania producers may show the necessity for a laboratory for our engineering bureau my remarks may not be amiss.

"The contracts let by the state highway department in western Pennsylvania from January 1 to September 1, 1927, which included all jobs on which any work was done during the past year, show that stone was used on only 36.2%, while slag was used on 63.8%.

"Our local association had several meetings with Mr. Goldbeck on this situation but owing to the lack of a laboratory he was unable to furnish us with data which he felt sure would help our cause but which he was unable to prove, therefore could not use.

"Fortunately for us we were able to get in a little intensive work with the state highway department and the prospects for 1928 are much brighter, but still far from perfect.

"May I not ask, gentlemen, that you allow our experience to serve as a warning, and get behind this movement for a properly equipped laboratory so that Mr. Goldbeck may carry out experiments which will benefit the entire stone industry."

H. E. Bair, France Stone Co., Toledo, reporting for Ohio, said:

"The demand in 1927 was steady and assisted by fair weather, production and sales resulted in a healthy increase in tonnage consumption as compared with the year 1926. There were no marked improvements in production methods but there is a general tendency towards improved preparation. There is still in this territory an overproduction with more than sufficient capacity to meet all requirements. There has been very little development of new properties or increased production facilities at old locations. Competition being extremely keen, as evidenced by the fact that in view of increased sales, the average price was approximately the same as received during 1926, plants with an unfavorable operating experience and high costs have been compelled in some cases to suspend operations entirely, while in other instances they have had to limit sales within a profitable radius of sales territory.

"Present advice received from consumers and producers indicate less optimism for as large a consumption this year as we had a right to anticipate at the beginning of the year 1927. Reduced railway revenues is causing a certain amount of pessimism in railway circles and if this condition continues a reduction in the use of railway ballast and for all other railway uses will be experienced. Plans for improvements and maintenance of tracks now being made call for as large a program as in 1927, all of which of course is subject to their financial condition at the time of purchase. There are no present indications of a slowing up in building, paving or road construction. It is anticipated the demand for all commercial purposes will equal that of the past year. The consumption of limestone for industrial purposes will necessarily be limited by the same factors governing expenditures on the part of the railways."

C. D. Brewer, Duluth Crushed Stone Co. of Duluth, Minn., reporting for the four producers in the state, said:

"January is a poor month for one from this state to make an optimistic report unless he is either a Finlander or an Eskimo, because the cold weather up there stops most work. Therefore, you must not expect to hear any words of encouragement.

"The year 1927 can be considered as having been about a normal year for the stone producers when looked at from a tonnage viewpoint, but when considered on the question of sales price, it was poorer than usual. Many members of this association do not know that the greater portion of the surface of the state of Minnesota is made from a glacial deposit of sand and gravel. This natural condition encourages temporary plants, some of which are owned by the contracting firms themselves. Such a condition quite naturally restricts the territory which stone producers can reach with their products.

"Nineteen twenty-eight looks like a repetition of 1927, for there are no prospects of our receiving higher prices nor much of an increase in tonnage. Our highway department has most of its contracts already let and these contracts largely cover the connecting links, or short stretches of hard surfaced roads that have already been constructed, so that the tonnage required for state work is going to be less than usual. Building operations are about at a standstill and it is too early for any producer to make an intelligent guess as to the amount of building that will develop during the first half of the year."

L. R. Cartwright, Midwest Crushed Stone Co., Indianapolis, reporting for Indiana producers, said:

"Most of the Indiana producers have enjoyed a fair increase in business during last year over that of 1926. Favorable weather conditions throughout the fall gave contractors opportunity to complete their work. This fact, coupled with good business conditions, generally has tended to reduce the amount of accounts receivable on stone producers' books to a comparatively low figure.

"An unusually rainy spring and early summer made it impossible for farmers to use a great deal of agricultural limestone and the demand for this product was somewhat reduced. Weather conditions during the summer and fall were extremely favorable, however, for maturing crops and the farmer is now in a more optimistic mood. If conditions in the spring and early summer are favorable, the farmer is going to be in the market for agricultural limestone which he has not used during the last two years. If prices are kept stabilized, a good margin of profit will be enjoyed on this product.

"The plan of the State Highway Commission to reclaim many of our highways with penetration macadam and their use of bituminous retread for maintenance is being copied by a number of our counties and is thus furnishing us an added market. The results where this type of construction and maintenance is practical are working great economies within our state.

"The tonnage in territory covered by our operations, which includes central and southern Indiana and Illinois, promises to be much the same as last year, with little change in prices."

A. J. Blair, Lake Shore Sand and Stone Co., Milwaukee, Wis., reported:

"In general, business in 1927 was poor both as to volume and price.

"Wisconsin, unfortunately for us stone men, is blessed with an overabundance of

James Savage, treasurer, National Crushed Stone Association

good stone and gravel deposits. About our only real hope for the future is in a statement recently put out by our state highway department, that in the building of a few concrete roads this year they will specify the strength required instead of specifying the mix, the latter being left to the contractor.

"Thus if concrete of the requisite strength can be made with crushed stone and less cement put in, then the stone producer may be able to meet the competition of the cheaper aggregate. This idea has to be proven and sold the contractor. We stone men have long believed it to be true. The National Engineering Bureau and research laboratory can help us in this.

"Our state has pioneered in building concrete roads, and if we in Wisconsin can get this plan successfully worked out and adopted it will undoubtedly benefit the whole country."

C. M. Doolittle, Canada Crushed Stone Corp., Hamilton, Ontario, spoke for Canada. He reported that conditions were much better in 1927 than they had been, with good prospects for 1928. Things contributing to Canada's present prosperity were the big grain crop, the second greatest gold production, the greatest wealth per capita of any country and the largest nickel ore deposits in the world. There have been built 600 miles of concrete roads, 260 and 228 miles of two bituminous types, 433 miles of macadam and 400 miles of gravel roads.

Continuing, he said that:

"The construction program of 1927 entailed an expenditure of $7,250,000, and some $2,750,000 was spent on maintenance.

"The 1928 program calls for an expenditure of some $7,000,000 and $3,000,000 for maintenance, and contractors have been asked to submit tenders for the first letting, February 8 for concrete 600 miles and mixed macadam 30 miles.

"Probably all of the 1928 work will be let this winter, giving the contractors an opportunity to get their equipment in shape and make an early start in the spring. It will be noted that many miles of the new type of mixed macadam road, designed by R. H. Smith, deputy minister, are to be constructed. This type of road is of interest to crushed stone producers in that it provides an outlet for screenings, requires some 5000 tons of stone per mile and eliminates detours.

In addition to the moneys expended by the Department of Public Highways on what are termed their own provincial highways, grants are made for county and township roads amounting to 30% to 50% of the cost of the same, and this has resulted in the counties and townships instigating quite an extensive road building program. While considerable work was done in 1927, much more is contemplated for 1928, and the outlook for the crushed stone producers in this direction is very good.

"The Canadian Pacific railway and the Michigan Central railway in Canada have for a considerable number of years used a large tonnage of crushed stone for their ballast requirements. In 1926 the Canadian National Railways started rock ballasting, and in 1927 their ballast requirements were doubled. It is the opinion of the officials that 1928 will again see a very marked increase in the amount of rock ballast to be used by that road. The railways in this country have used nothing but crushed stone for their main lines, and the crushed stone producers in Canada can look forward optimistically in regard to the future of the ballast programs of the railways.

"Many large and important structures are planned to be built this coming year. The Canadian Pacific Railway Co. is building a $10,000,000 hotel in Toronto, and the other contemplated projects in this city run into some $40,000,000. Various other cities in the country have large building programs.

"To sum up the situation from the crushed stone standpoint, prospects are exceedingly bright for 1928."

A. S. Lane, of John Lane and Sons, Meriden, Conn., reported as follows for Connecticut and Massachusetts:

"I have been in communication with most of the Massachusetts producer members and the reports as to conditions are practically uniform throughout the state.

"Apparently the tonnage for 1927 was

about 15% over 1926. Prices running without much change and general conditions being good, except that two refer to collections as slow.

"For 1928 all are apparently expecting still better business without much change in prices.

"While the flood damage in Vermont and New Hampshire was very heavy, it is not thought that this cause will particularly increase the tonnage, although Massachusetts quarries supply much of the material used in those states.

"One member only spoke of increasing plant capacity this winter.

"I think it may be said that the industry in Massachusetts is in a fairly healthy condition."

J. A. Ogden, Dittlinger Lime Co., New Braunfels, Texas, reported for his state:

"1. The total tonnage marketed by the Southwestern Division of the National Crushed Stone Association was 1,577,000 tons. This total is approximately 90% of the total production in Texas.

"2. With the exception of one plant, the producers reported that railroad service was very satisfactory.

"3. The labor situation during 1927 was good. No shortage of labor is expected.

"4. Insurance rates, including tornado, fire and compensation insurance, are considered to be high.

"5. For the coming year, 1928, prospects are for an increase in tonnage. Highway construction in the state of Texas should be much larger than during 1927, as a much larger program of surfacing or paving projects is contemplated."

A. L. Worthen, Connecticut Quarries Co., New Haven, spoke for Connecticut. He said that the producers of the state had had a very successful year. A large volume of business for 1928 has already been booked.

F. T. Gucker, John T. Dyer Quarry Co., Norristown, Penn., reporting for eastern Pennsylvania, said that conditions were expected to be about the same in 1928 as they had been in 1927—very satisfactory.

Russell Rarey, Marble Cliff Quarries Co., Columbus, reported as follows for Ohio:

"Stone sales for 1927 were good, approximating our 1926 tonnage. Stone for construction work and road building experienced fairly satisfactory demand. Weather conditions throughout year almost ideal for quarrying operations and construction work. Favorable weather contributed to early completion of many projects, flattening out demand during late fall months. Labor conditions satisfactory. Year as a whole was good, although much tonnage lost to competitive materials on account of the increased production of, and lower price on, substitute materials.

"Nineteen twenty-eight has every indication of being a satisfactory year for the stone business. Road construction and maintenance is adequately financed for 1928, and we should be able to secure a fair portion of this business.

"Building construction continues to maintain a high level, with prediction for continued high building activity in 1928. This in spite of the fact that central Ohio is now provided with more than an adequate supply of dwellings, apartment houses, office buildings, theaters, hotels, etc. It is believed we shall experience a shrinkage in building construction during 1928. Railroads are in excellent condition financially and should take a fair volume of ballast for maintenance and renewal purposes. No new lines, and but little double tracking, is scheduled in our vicinity, hence ballast tonnages will not reach high level. Barring the possibility of business reaction due to 1928 being presidential year it would seem that 1928 should be fairly satisfactory, although not so good as 1927."

J. R. Boyd, secretary of the National Crushed Stone Association

John Rice, General Crushed Stone Co., Easton, Penn., said for Eastern states generally:

"Speaking from my knowledge of the business conditions affecting crushed stone in the Middle Atlantic states and eastern New England, I am glad to report a very successful experience last year, as regards railroad ballast, highway construction and other uses.

"The relations of competitors were cordial and co-operative, having purchased and sold fairly large quantities to tide over shortages and peaks.

"From information gathered from our branch sales managers and from knowledge gained through my connection with the Atlantic States Shippers Advisory Board, I am inclined to believe that 1928 stone production will prove to be quite as vigorous as that of 1927, even though general business may meet with a slight decline, both because of catching its breath for another rush and because of the usual distractions of a presidential campaign."

H. E. Rodes, Franklin Limestone Co., Nashville, spoke for Tennessee and Kentucky, saying:

"The outlook in Tennessee and western Kentucky is exceedingly good for 1928; in fact, a shade better than 1927, which, in the same territory, proved to be a good year for the stone industry.

"This outlook is very much more optimistic because of the very effective and capable work done by Mr. Goldbeck, with the Tennessee State Highway Department in the latter part of 1926, and his work is bearing fruit in the form of the highway department taking bids on concrete pavement, using the alternate aggregates of gravel and stone, and they are willing to pay more for stone aggregate than for gravel aggregate.

"We have found the co-operative work of the Tennessee Crushed Stone Association, functioning as a branch of the National Association, to be of considerable value, both in the work that it does and in the impression that it creates in the minds of others."

F. W. Schmidt, Jr., North Jersey Quarry Co., Morristown, N. J., reported for New Jersey that:

"The crushed stone business in the northern part of New Jersey, for the season of 1927, was good; the car supply was adequate and labor conditions satisfactory. The weather was favorable during the early part of the season, but operations were held up somewhat in the late summer and fall because of excessive rains. Competition was keen and in many cases the selling price was slightly less than it should have been.

"The outlook for 1928 is fair, demand for material for road construction purposes should be slightly better than the average. The railroad construction and ballast work will require about the usual amount of material, but this of course will be influenced to a large extent by general business conditions. If the roads do a large volume of business they doubtless will require more materials, but if on the other hand general business slacks off the railroads will doubtless desire to cut maintenance cost. The building construction program, requiring the use of crushed stone, is not large and not much demand is looked for from this source.

"Capacity of the plants operating in this territory is in excess of estimated requirements. So far as it is possible to determine at this time, normal operating

conditions for the 1928 season are looked for. They will of course be largely governed by weather conditions."

W. L. Sporborg, Rock Cut Stone Co., Syracuse, reported for New York as follows:

"In the state of New York our business was good in 1927. Some concerns, not all, had their very best year. Labor was adequate for our needs and for the needs of our customers. Rail transportation continued at its high level of efficiency. The motor truck again increased. Railroad ballasting was about the same as in 1926. Highway construction was more. The future carries the promise of continued prosperity. Agriculture has improved somewhat. Industry earns profits. Good wages are paid. Labor has employment. Our standard of living, our railroad efficiency, low inventories, small losses from installment sales, the ease of credit, our enormous buying power, all work together for activity. We are building this wonderful highway system. We are rebuilding our cities. We cannot believe that all the work we see, waiting to be done, will be permitted to stop. We can more easily believe that more effort, more materials, more labor, more accomplishment, rather than less, will be required of us as time goes on. Our standard of living in this wonderful country of ours, our modern homes, our leisure, the new foods we eat, the good clothes we wear, the ease of communication and travel, all may seem primitive in the years to come. The best years are still ahead."

O. P. Chamberlain, Dolese and Shepard Co., Chicago, reported for Illinois that:

"The outlook for 1928 business in the crushed stone industry of the Chicago district, is that the volume of business will be about the same as in 1927.

"During 1927 considerable state highway construction was contracted for and constructed, thus putting the $100,000,000 Illinois state bond issue to work. The stone industry in this district benefited materially through this highway construction.

"Much highway construction, consisting of the building of new roads, as well as the widening of existing concrete roads in Cook county, is now well under way. Some few roads have been widened. Much road widening from existing structure of 18 to 20 ft. to a width of 40 ft. has been authorized by the Cook county authorities and construction will proceed early in 1928.

"General housing, including residences, office buildings, hotels, clubs and similar construction, will probably run, in 1928, not over 75% of the volume of this character of construction in 1927. It is the hope of the Chicago district operators that the increase in volume of road construction will at least offset this prospective falling off in other structural work.

"It is difficult at this time to predict what the agricultural limestone business of 1928 will be. The 1927 season, following bad weather conditions for harvesting in 1926, and a general pessimism among farmers and bankers as to the financial conditions in the rural districts, resulted in the 1927 business being no larger than that of 1926.

"Prices of agricultural limestone were very low in 1927 and promise to remain low for the greater part of the period of 1928. These low prices should induce farmers to purchase in better quantity than during the past two years. They appreciate the value of agricultural limestone for acid soils and it is hoped that they will take advantage of present conditions in the manufacturing of agricultural limestone and thus increase our volume of sales for 1928 over 1927.

"Prices, generally, were no higher in 1927 than in 1926. Most of the producers are optimistic enough to predict better prices for 1928. As the cost of production of crushed stone in this district is somewhat higher now than it was a year ago, with no prospect of a recession in cost, earnest effort should be made by all operating producers to advance the price at least sufficiently to overcome the increased cost of production. It is believed by most of the producers in this district that this will be accomplished in 1928."

J. W. Stull, Rocky Point, Va., reported for Virginia, and said:

"The time allotted for this report will only permit me to touch the high spots and those spots, I am glad to report, are higher up on the scale of prosperity than ever before in the history of the crushed stone business in the South.

"During the year 1927 general building projects were above normal and road construction requiring the use of crushed stone was in Virginia and many other of the southeastern states greater than in 1926. The quantity of railroad ballast used was in some instances reduced on account of freight rate complications in the coal industry and because of this some of the quarries in the district suffered serious losses. On the whole, it may be said that the southeastern quarries produced more crushed stone for all purposes in 1927 than ever before in their history. Selling prices, however, were lower than in former years and the tendency of the business has been in this direction for some time.

"Nineteen twenty-eight begins with a hard times howl. The railroads in many instances have reduced ballast quantities and a reduced number of building projects are being put under way. Road construction is still going and a normal tonnage of stone will be used in our district for this purpose. On the whole, the outlook is not as pleasing to me as it was in January, 1927."

A. R. Wilson, Granite Rock Co., Watsonville, Calif., made the last of the directors' reports, saying of California that:

"The year 1927 has been a period of proverbial darkness before the dawn, so far as the crushed stone industry in central California is concerned. Business has been irregular and rather demoralized from the price standpoint, but better times are indicated in the near future.

"A tremendous overproduction in the gravel industry has had a tendency to drive prices down to the point where very little if any profit has been realized by the producers. The selling price of material has been subjected to considerable fluctuation, as each individual job of any size has had its own set of prices. The total volume of business for both crushed stone and gravel was not in excess of 1926, if as great, and several new gravel plants were added to the ranks of the producers. This slowing up in business was due in part to a curtailing of building operations in the San Francisco Bay district. The volume of highway construction, both by the state and counties, was less, and railroad expenditures were only average.

"The outlook for the year 1928 is somewhat better. The state of California has added 1 cent per gallon to the gasoline tax for new highway construction. The city of San Francisco has voted a bond issue of $9,000,000 to be spent during the next two years for boulevards furnishing additional outlets to the city. In addition, considerable building construction is contemplated for this year.

"There is a tendency among state and city engineers to specify crushed material for concrete aggregates. However, the gravel producers have succeeded in having crushed gravel approved in many instances and the sale of crushed stone has to be on the basis of the superior quality of the product. If cheap and plentiful credit continues during 1928, material producers in this section of the state should have a year of average prosperity."

C. B. Andrews, of the Taylor-Wharton Iron and Steel Co., reported for the Manufacturers Division, and said that the exhibit was going to be a better show than ever this year. Last year there were 52 exhibitors in 64 booths, and this year there would be 64 exhibitors in 78 booths.

The principal job which the division now has before it is the raising of the $5,000 which is required for the laboratory fund. It was hoped to close the book on this before the convention ended.

The Manufacturers Division has added 16 new members in the past year.

Luncheon Address

At the "greeting luncheon," to which everyone was invited, the only address was by ***William J. Matthews,*** an attorney, who is counsel for a number of trade associations, including that of the manufacturers of explosives. The address had the title, "Industrial Sovereignty and Common Welfare,"

but Mr. Matthews explained that this meant nothing more than "individual action or co-operation."

The address was of the "inspirational" type, as was proper for the occasion. A good point it made was that business men now have pretty definite ideas as to how they should conduct themselves toward competitors; that they know when they are abusing ethical standards, and for that reason there is nothing a business man fears more than the ostracism of those who are in the same line of business. And this feeling is a really powerful force in our industrial civilization. He quoted Herbert Hoover, who has said that the outstanding fact in modern business was the tendency toward group action and the development of trade associations. Some people are wondering if we are not making a fetish of co-operation, and if the effort to establish an equilibrium between production and consumption is altogether a good thing. But, none the less, out of this effort is coming a real improvement to industry and the stabilization of prices.

As to the stabilization of prices, he told the association that now it could legally do almost anything that would stabilize prices. At first courts looked with suspicion on any association of men in the same business. Laws were construed to compel men to "compete brutally," and they could not divulge details of their business to competitors without being accused of illegal combination. But now a merger is being effected between law and economics by the courts. Business is becoming professional and law becoming more of a business.

To be sure, there are still men who are basically and constitutionally unable to think decently of a competitor, the kind that say, in effect, when they meet: "How is business, you damn liar?" Such people are willing to accept the benefits that come from an association, but are not willing to contribute. But they must realize that the only improvements that any industry can make must be brought about by knowing the facts of the industry, and there is no place to get these facts except from the industry itself.

Salesmanship must be on a basis of quality and principle. The salesman who has the one idea that the way to get business is to reduce the price is the worst kind of a fanatic. And the man who is conducting a business should never forget that when he is dealing with an individual customer he is also dealing with the whole market of his industry.

The establishment of a laboratory for research work, Mr. Matthews said, was decidedly a step in the right direction, for this is the age of competition between groups with the laboratory as the chief stay and support of each group. He drew instances from some of the associations with which he is connected, showing how the laboratory not only helped the industry but performed a real public service, assuring the public of the high quality of the product which the laboratory had tested. He thought it would reflect severely on the association if it was found to be unwilling to establish and maintain a laboratory.

Modern Bituminous Roads

A. H. Hinkle, superintendent of maintenance, State Highway Commission, Indiana, presented a very comprehensive paper, illustrated by lantern slides, on the methods he has devised for resurfacing, and building up, old macadam and gravel roads. Although an old subject, he said, it was one that was getting more important every year, because much of the road building now being done, and to be done, is off the primary road systems, where the cost of the improvement is the all important consideration.

Mr. Hinkle made it perfectly clear that he was not advocating these types of road surfacing as a substitute for more permanent types of roads, subjected to heavy traffic, but merely as a practicable method of preserving the investment in old roads and of providing smooth riding road surfaces for comparatively light traffic at a cost within the reach of many communities which could not afford the more permanent types of pavement.

The two bituminous types and sub-classes used in resurfacing in Indiana, Mr. Hinkle described as follows: (a) Plant mixture; (b) Field mix; (1) surface treatment; (2) mulch mix; (3) retread top; (4) penetration macadam. The secret in the success of all of these pavements, he said, was just the right amount of bituminous binder; there is a very narrow margin between enough to prevent raveling of the surface and so much that there will be rolling and waving in the surface. This is one reason why the field mix, with a cut-and-try method, gives satisfactory results because it is easy to add more bitumen, or more aggregate, as the case may be, in the making.

Another important factor in success with these types of pavement roads is the proper curing of the bituminous binder before final rolling. Cold mixtures are used, cut-back bitumens (asphalt or tar), and there must elapse sufficient time to give the volatile material in the binder a chance to evaporate. If rolled and surfaced before the proper curing the bitumen remains so fluid as to cause waving; and if the curing proceeds too long the binder gets so stiff that it is impossible to consolidate and roll materials satisfactorily.

Other factors in this type of construction are avoidance of fine material, which causes waving in the completed surface, and the dragging and harrowing of the materials in place prior to rolling. In short, it was clear from his description that considerable skill was necessary to get the results desired. Much depends on the stability of the base, the old gravel or macadam road, for the surface itself has little or no strength.

These types of bituminous resurfacing are being used extensively in Indiana, and the success Mr. Hinkle has had with them has attracted national attention among highway authorities. Apparently a considerable tonnage of crushed stone, gravel and slag is now being used for such highway improvement.

Geo. E. Martin, consulting engineer, The Barrett Co., New York City, amplified Mr. Hinkle's paper somewhat, also saying a good word for waterbound macadam, with surface treatment.

How a Research Laboratory Will Benefit Producers

A. T. Goldbeck, director of the bureau of engineering, presented a paper summarizing the advantages of a research laboratory. A part of his paper follows:

"Problems requiring investigation will immediately occur to all of you, and I shall always welcome your advice as to the problems with which you are confronted. Certain questions can be answered by laboratory researches which we can undertake; others must be left to governmental, state and university laboratories having special facilities, while still others cannot be solved in the laboratory but must be undertaken by statistical methods and by investigations in the field.

"The following problems occur to me as needing solution and I have attempted to list them in the order of their importance to the industry as a whole:

"I. What is the effect of coarse aggregate on the transverse, tensile and compressive strength of the concrete?

"Such an investigation will answer the following typical questions:

"(a) What cement content and proportions of fine and coarse aggregate having various characteristics will result in the same cross-bending strength of concrete?

"In explanation of this question, let me tell you that the resistance of concrete to cross-bending is now considered the most important property highway concrete should have, because concrete road slabs crack and break up largely because their cross-bending resistance has been exceeded. It is now almost the universal practice to specify concrete proportions by volume irrespective of the resulting difference in cross-bending strength, irrespective of the difference in voids in coarse aggregates which results in more cement per cubic yard of concrete in one case than in another, and irrespective of differences in workability. The ideal for which the engineer should aim is the production of dense, durable concrete having a given cross-bending resistance and this will require different proportions for the various aggregates. It would be of very great value to us if we had information on the effect of the coarse aggregate on the proportions of concrete necessary to produce the same cross-bending or transverse strength.

"(b) What is the best gradation of stone for the greatest yield and strength of concrete?

"In competition with other aggregates, it is desirable to so grade the coarse aggregate that a high yield of concrete on a low ce-

ment factor will result. Therefore, it is important that we obtain specific information on the best gradation of stone that will accomplish this purpose. Especially is this problem important in view of the increasing tendency to require the shipment of stone in two or more sizes later to be recombined in the best proportions for highest strength and highest concrete yield.

"(c) What is the effect of increased stone content on the transverse strength of concrete?

"This problem also has to do with the shipment of stone in several different sizes for later combination in the best proportions and will give us definite information on whether we should consider plant alterations to best make this type of shipment. It is desirable that we be forearmed with information which will indicate to us the trend which specifications may take.

"II. What is the effect of repeated stress on concretes having different kinds of coarse aggregates?

"Thus far all comparisons of coarse aggregates have been made on the basis of strength tests, either compression, cross-bending or tension in which the load has been applied slowly until failure takes place. In concrete roads, however, loads are not applied once, they are applied hundreds of thousands of times due to the passage of vehicles, to the effects of temperature and moisture changes, and to the effects of variations in support offered by the subgrade. What is the effect of these repeated loads on concrete in which the coarse aggregate varies from smooth, rounded fragments to rough angular fragments? Such an investigation will throw light on the proper unit stress to be employed in the design of concrete roads when the aggregate is different in one case than in another. Thus, we shall obtain more definite knowledge on the relation of the thicknesses necessary to produce the same resistance to the loads of traffic and other repeated loads, as this relation may be altered by the characteristics of the coarse aggregate.

"III. A study of the effect of aggregate on workability of concrete with the idea of determining how to proportion stone concrete for the highest workability. In explanation, it is not so well known that harsh working concrete may be improved in workability, and without decreasing its strength, merely by the addition of more sand and without necessarily adding more cement. More information is needed along this line.

"What are the laws which will make for equal workability when different coarse aggregates are used? I believe it will be possible to determine how to proportion stone concrete so that it will always be highly workable and at the same time will be not lacking in strength and economy.

"IV. What is the real effect of dust-coated stone on concrete? This question has never been definitely stated and it is one which often causes trouble when stone is produced in wet weather. Some specifications limit the percentage of stone dust by weight. What are the real facts? What is the maximum amount of dust which should be permitted? Is it going to be necessary to wash stone? Let us get the answer by a well laid out series of laboratory tests.

"V. Study the question of soundness of aggregates. Under this study would come such investigations as studies of the various accelerated soundness tests such as the sodium sulphate test, sodium chloride and the boiling test versus freezing and thawing tests, not only on aggregates but also on concrete made with these aggregates. At the present time there are plants producing enormous quantities of aggregates which fail in the sodium sulphate test for soundness and yet these aggregates are giving good service. None the less it is frequently the case that aggregates are rejected merely because they show unsoundness in the sodium sulphate test. A study to develop a truly suitable accelerated soundness test which agrees with service results would be well worth while and would remove the stigma for many limestones which are now thought to be unsound merely because of the effect of the sodium sulphate test.

"Certain aggregates contain a small percentage of deleterious material and among the questions which arise are, 'What are deleterious substances and what percentages should be permitted?

"VI. Study the stability of bituminous concrete mixtures containing various coarse aggregates. In explanation, it might be stated that crushed stone inherently is the most stable coarse aggregate which can be used in bituminous mixtures because of its rough surfaces and interlocking effect, but it would be of value to obtain a quantitative measure of stability or resistance to shoving under traffic of various bituminous concretes made with different materials in order that definite laws may be set up governing the proper proportioning of such mixtures. What is the effect of the degree of angularity and roughness of the coarse aggregate and how do these affect the stability and the proportions of the mixture necessary for the highest stability?

"VII. How do the physical characteristics of the various coarse aggregates compare throughout the country? We should have definite information on the physical characteristics of competing aggregates. We already have abundant information on stone in the published reports of the United States Bureau of Public Roads but corresponding reports have never been published on gravel nor on slag, although much of this information is in existence. On the other hand, much of it is lacking and as a routine feature of the laboratory we should continue to collect samples of materials of various kinds in order that we might be in a position to compare their various physical characteristics. A study of competing materials is quite as necessary as a study of our own material.

"VIII. Study the merits of stone sand for use as a fine aggregate in concrete. This question is one of importance to a number of producers, especially in those localities where sand is expensive. A study of the best gradation of stone sand for the highest strength, yield, and workability would be of value and, in general, a study of the use of screenings, particularly in concrete products, would be of value, to show the advantages of this material. Studies for the purpose of designing concrete having given characteristics for use in concrete products should likewise be made.

"IX. Study the question of segregation and means for preventing it. This problem has never been studied in a systematic way. It would seem that laboratory tests may serve a very useful purpose in overcoming what now is a very troublesome question in most stone plants.

"X. Special tests made for a particular purpose such as the design of concrete mixes for given strengths when particular materials are used. I have in mind that the laboratory may be useful in determining the most economical proportions of concrete for given jobs where it is desired to obtain strength results with the greatest economy. Work of this kind can naturally only be carried on to a limited extent and preferably in connection with the main research programs.

"Other problems may occur to a number of you as they also occur to me and, unquestionably, important questions will arise as the work proceeds.

Suggested Policy of the Laboratory

"It must be quite apparent to all of you that with the funds available we shall have a very limited personnel. Every dollar and every minute will have to be used with telling effect. The work, therefore, must be laid out in the form of research programs so designed that they will give the answer to questions which are troubling the greatest number in the industry. By no means should the laboratory be used to compare the relative merits of one producer's product with another's and technical papers issued from the laboratory should avoid direct mention of the name of a particular producer. When it is necessary to describe the stone used in investigations it probably should be done by general geographic location and by its physical characteristics.

"The whole question of policy may be summed up in the statement that the laboratory must be operated for the good of the entire industry and not for the particular benefit of any company or group of producers in their competition with other producers of crushed stone. It is plain to see that any other policy would be disastrous, but I know from experience that I may rely on your whole-

hearted co-operation to the end that the research work may be conducted for the good of all. I wish to congratulate you on your decision to participate in research and to express the hope that its usefulness will soon be made evident to every producer."

Mr. Goldbeck followed up his more formal paper with an informal "blackboard talk" to illustrate a single phase of research recently accomplished in the field laboratory of the Bound Brook Crushed Stone Co. First he illustrated the flexure of concrete pavements under wheel loads, and why cross-bearing strength is essential, rather than compressive strength. The present state specifications call for a 1:1¼:3½ mix. This mix, using trap rock because of the greater voids, requires 6.8 bags of cement against 6.3 bags for gravel. Since the specific gravity of the trap rock is 2.9 against 2.6 for gravel, the disadvantage of the stone producer, faced with gravel competition, is obvious.

However, taking cross-bending strength as the criterion and using the same amount of cement (6.3 bags) in the mix, a 1:1.7:3½ trap-rock concrete was 10% better than a 1:1.35:3½ good gravel concrete and 30% better than a poor gravel concrete. Differently stated there would have to be a 5% increase in the thickness of the good gravel concrete pavement slab to be equal to the cross-bending strength of the trap-rock concrete. Or, for equal thicknesses of pavement concrete of the same cross-bending strength made from the different aggregates, would require 6.0 bags per batch for trap-rock, 6.3 bags for good gravel, and 7.5 bags for the poor gravel.

John W. Stull, Rocky Point, Va., discussed Mr. Goldbeck's paper. He commented on the great variety of stone found in various parts of the country and the absolute lack of knowledge of the characteristics of these stones. The establishment of an association research laboratory offers, he said, the only feasible means of getting such data. The excellent work already done by the engineering division has had a wholesome effect in causing construction authorities to pay more attention to quality than ever before, Mr. Stull said.

Report of Committee on Standards

Col. O. P. Chamberlain, of Chicago, presented the report of the committee on standards, of which he is chairman. This is divided into three sub-committees, but only one chairman of these was present, ***Fred A. Gill*** (Gill Rock Drill Co.), of the committee on standardization of drill equipment. Mr. Gill reviewed the progress that his committee had made in having manufacturers adopt a standard thread and taper, the same that had been adopted by the American Petroleum Association. He had not found either manufacturers or users any too eager to make changes, and some concessions had to be made to get even this much standardization. However, this was a start. A great deal remained to be done, and he suggested more members might perhaps be added to the committee in order to have the work done more quickly.

The report of the committee on standardization of quarry tracks and cars was read by Col. Chamberlain, who made some comments and added parts of his correspondence with ***W. E. Farrell*** of the Easton Car and Construction Co., who is chairman of the sub-committee.

The committee has already recommended the adoption of three standard gages of track, and the recommendation has met with no opposition. But as regards the standardization of quarry cars there is a different feeling among manufacturers. Also, it is apparent that there is but little interest in the subject among the users of quarry cars. Every user may need some advice as to the type of equipment he will use, but the advice he wants is that which meets his own particular conditions.

Each manufacturer is jealous of his designs and guards his information carefully. No manufacturer wants to put out a copy. The tendency is for all manufacturers to specialize and to look upon their specialties as a part of their stock in trade. The matter of standardization is really a manufacturing problem, and if it is brought about it will be by the co-operation of operators who study their transportation costs and manufacturers who want to help. One of the greatest obstacles to this co-operation is that operators do not know what their transportation costs really are.

W. R. Sanborn, Lehigh Stone Co., the chairman of the committee on standardization of crushed stone sizes, could not be present. Col. Chamberlain reported for him that the committee had not made much progress since its last report. "None of us know where we are going to land, in the standardization of crushed stone sizes," was the way Col. Chamberlain put the situation. His own company, in the Chicago district, could get along with seven sizes, but some companies in the same district made as many as 15. The crushed-stone producers make as many sizes as they can sell.

Membership Committee

J. R. Boyd, secretary of the association, presented a report as chairman of the membership committee. This showed that 24 new member firms had joined the association in 1927 and that 354 new memberships had been secured. Not all of these were from the new firms, for some were increases in memberships from companies which had long been members. A definite statement of losses and gains could not be made at this time, as there is some "deadwood" now on the books of the association which will be definitely taken off before the next meeting.

Prospects for new members are obtained from trade journals and from reports by individual members. They are written to and letters are followed up. But experience has shown that personal contact is the one really effective method of obtaining new members. About 600 letters were written to prospects and only a few replies received.

Broken Stone Cost Keeping Suggestions

Dr. George E. Ladd of the Bureau of Public Roads, whose work for the bureau in securing and tabulating the direct production costs of crushed stone is so well known, delivered a paper, "Broken Stone Cost Keeping Suggestions," at Tuesday's session. He took as a sort of text an editorial in the *Saturday Evening Post* which pointed out that among corporations, mining and quarry corporations showed the lowest percentage of profitable business. About 70% of such companies reported a loss.

Dr. Ladd spoke of his cost work, already mentioned, and said it had been received very differently by different people. One large crushed stone operator wrote that he considered it the most valuable contribution that had been made to the literature of the industry, while some others, and some trade and technical periodicals, attacked his showing that one of the smaller quarries had the lowest cost, quite overlooking the fact, which he had pointed out, that this was because of special conditions peculiar to that quarry.

He said that he hoped to be able to go on with the work at some future time, since a mere statement of costs was only a starting point. The conclusions to be drawn from them were the really important things.

Efficiency, he said, depended upon the adaptation of the method to the given conditions, the topography and such matters as blasting in the vicinity of dwellings. The spacing of holes, the choice of explosives, the method used to reduce boulders, the size of shovel employed and the way labor was handled, these and a number of other things all entered into efficient or inefficient operation.

Bookkeeping and balance sheets are no particular help in determining whether an operation is efficient or not, but cost-keeping really does determine it. The quarries studied for the costs in the published tables had been under his observation for several summers (with the exception of two). When the costs were actually determined it was interesting to him to know that they bore out his general observations as to the efficiency of different operations. What had started as a cost study ended in being an efficiency study.

Dr. Ladd here reviewed some of the details of this study, telling of the changes that had to be made in the cost keeping forms. He read a long list of sub-headings that it had been found necessary to

consider in order to get cost in sufficient detail. Some special studies had to be made, such as the study of the cost of "steel balling" of boulders, which Dr. Ladd said was well worth the investigation of any operator who was using other methods of breaking boulders. Some of the significant facts that had developed were:

That power costs were cheapest where electricity was used (the current being purchased from a public corporation, as he explained in answer to a question).

Drilling costs were cheapest where mechanical drill sharpeners were used.

Well drilling had been found the cheapest method of breaking the face except in high faces of jointed trap rock in which drilling with tripod drills was found to be cheaper. He gave examples from two quarries in which 15 cents and 16 cents a ton had been lost by changing the method of drilling.

Where hand labor was employed in loading, contract labor was as much more efficient than day labor as 3 is to 2.

Four plants each producing about 2000 tons per day had cost of 42.4 cents, 28.28 cents, 34.71 cents and 31.30 cents as direct operating costs. The highest cost came from a quarry of pit form in which contract and day hand labor were employed. It had three times as many boulders to break as the quarry with the lowest costs. The plant which had the second highest cost was a pit and steam instead of electric power was used. Delivery to crusher involved hoisting and extra expense.

Studies of this kind enable an operator to see where the trouble lies. In any event it enables him to check up his work. Groups of plant owners keeping costs and exchanging results could in this way secure valuable information. But it must be remembered that the conditions of each quarry must be considered before costs were compared.

As examples as to how much could be made by small savings in quarry work, he mentioned two quarries each producing about 2000 tons daily. At one the drilling cost was 3¾ cents per ton, at the other 2¾ cents. For blasting one spent 6.16 cents and the other 4.01 cents. The difference in blasting costs alone amounted to more than $10,000 a year.

In one quarry 7¾ cents more per ton was spent for breaking boulders than in another and similar quarry, and the difference amounted to $43,000 per year.

A plant using steam power showed a power cost of 10.13 cents per ton, while another and similar plant using electricity had a power cost of 6.03 cents per ton. The difference amounted in a year to $23,000. The ultimate power cost would, of course, be dependent on fuel cost, but in every quarry studied electricity had been found to be cheaper. It is true that steam may cost less per horsepower made, but electricity had been found to be cheaper per horsepower actually used in production.

As to the labor problem, Dr. Ladd said that was largely a matter of the intelligence and loyalty of the foreman.

Discussion

The discussion of Dr. Ladd's paper was led by ***J. R. Thoenen*** of the Nonmetallic Division, U. S. Bureau of Mines. He said in studying costs the individual operator was too close to his own costs to see them in proper perspective. What was needed was a standard of comparison. But it was obviously impossible for a single operator to go about collecting costs and studying conditions at different quarries. By the time he had assembled his data and made his studies the costs would be out of date.

But if the industry feels that a cost study would be of benefit the Bureau of Mines is ready to make such an investigation. Mr. Thoenen said he had been looking over the entire rock products field with this work in view and had been struck by the similarity of conditions in crushed stone, sand and gravel and crushed slag preparation. The problems of stripping, loading and transportation are the same in some quarries and some sand pits, and the problems of screening and sizing are the same in all three industries. So a cost investigation might well cover the whole rock products industry, as the greater the number of units considered, the nearer the average of these would come to the true average cost. He had already taken up the matter with the National Sand and Gravel Association and received a favorable response. The research committee of the Portland Cement Association had also expressed its willingness to co-operate.

He had prepared a questionnaire that operators would be asked to fill out in case the industry wanted a cost investigation made. Samples might be seen at the Bureau of Mines booth, and he would be glad to have suggestions from members as to how this tentative form might be improved.

It was decided after some further discussion to allow members time to examine the questionnaires before going further with the matter.

Recent Steps in Business Self-Government

The address "Recent Steps in Business Self-Government," by ***Gilbert H. Montague,*** a New York attorney who acts for several trade associations, was devoid of frills and a fair exposition of what a trade association can and cannot do. He said he came with an "inspirational" address in his pocket, but threw it away when he saw the character of the association he was to address. He assumed that the membership was familiar with recent decisions by which the legality of exchanging information of stocks on hand, costs and the like might be exchanged. But he thought the degree to which exchange of information of prices might be carried was important to know.

He did not believe that bids could be exchanged until the bids had ripened into contracts, in which case they might be reported at once to the secretary of an association to go on his record of sales. It was quite

Members of the National Crushed Stone Association

legal to keep a record of current prices in this way, and this is being done in many businesses. As regards the exchange of bids before the contract has been awarded, the courts have not yet gone so far as to declare this legal.

One of the problems that every industry has to meet is the interference of competitors with contracts that have already been awarded. As an example: a producer gets a contract on a verbal agreement and a competitor who finds it out goes to the buyer and makes an offer at a lower figure. The buyer then gives the producer the choice between making a new contract at a lower price and losing the business altogether.

In some of the trade associations with which Mr. Montague is connected he is trying to have a uniform acceptance of contract form introduced to prevent such interference. Aside from this, the producer may protect himself by writing a brief letter stating what he understands to be the terms of the sale and receiving the buyer's answer. The letters constitute just as binding a contract as an instrument under seal, and it is better to protect oneself this way than to have to carry the matter into courts. If this were made the custom and a competitor persisted in interfering with sales already made he might be disciplined by the association.

Mr. Montague judged from experience with a trial in which crushed stone was involved that the industry badly needed a vocabulary. The terms used were not understood by those outside the industry, and they were not found to be the same everywhere throughout the industry. He gave an apt illustration from the mahogany dealers association in which a lawsuit was avoided and the chances for future suits of the same kind were obviated merely by getting the manufacturers and dealers to agree on such matters as what a "mahogany" chair really was. He thought the stone men could profitably appoint a committee to work up a standard set of terms to be used throughout the industry.

The tendency of federal commissions is to say that producers should sell f.o.b. plant, or point of origin. The difficulties which the bituminous coal industry, and to some extent the cement industry, are finding in the conduct of their business come from not observing this rule. One suit after another has come because this practice was not universal in these industries.

He congratulated the association on being a federated body, that is, an association made up principally of local associations. Local associations could study such problems as those which had almost wrecked the coal industry and suggest solutions which the national body might accept or reject. There were such problems as standardization, for example. This had proven a difficulty to the electrical industry until the industry finally standardized its terms so that now an electrical engineer knows exactly what he will get if he orders a 10-hp. motor.

The time to make these changes and adopt these methods, he said, is *now*. The association has a splendid opportunity to apply proper association methods that will standardize trade customs and prices and keep clear of legal entanglements.

Association Methods Discussed

The discussion was led by ***John Rice,*** who asked what the situation was in New York state in regard to exchange of prices. Mr. Montague answered that New York had a rigorous anti-trust law that forbade agreement on prices, but that producers were not limited in exchanging information.

Mr. Rice said that they had tried to exchange information in one association, but not all the members desired to do so. There seemed to be a lack of confidence. Mr. Montague answered that only the paid secretary of the association or a charted accountant ought to see such figures, and he should report only averages. Mr. Rice said that they had done this but had found average figures to be of little use, as conditions at one quarry varied so greatly from the conditions at another quarry. Attempts to classify operation had not been successful, as there were not enough quarries for a successful classification. Mr. Montague thought that in the National Association it would be possible to set up classifications with plenty of examples in each class.

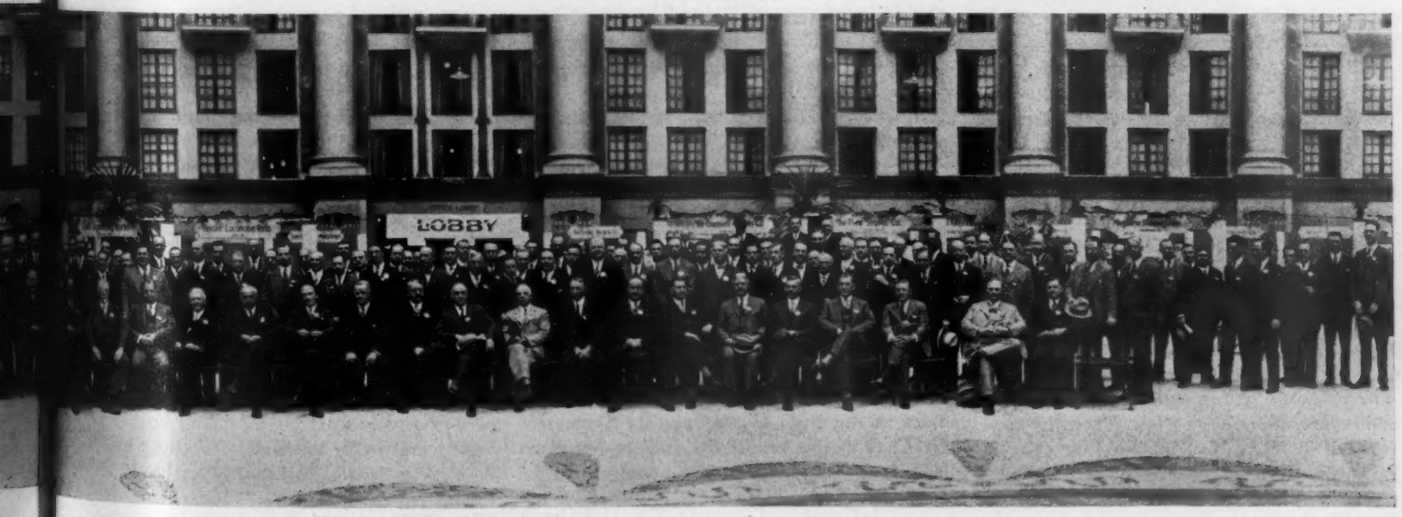
Continuing, he said that certain details, such as transportation costs, or handling charges, might be profitably collected, and that he had known of much self-education to result from a study of such detailed figures.

W. M. Andrews, of the Carbon Limestone Co., said that his company's quarry is cut through by the line between Ohio and Pennsylvania. He wanted to know if it was necessary to consider all the shipments from such a quarry as interstate commerce. Mr. Montague said that he could see no way to avoid it, since the quarry was a unit and could not well be divided for freight rates.

John W. Stull, Rocky Point, Va., asked what could be done where quarries on one line of railroad were favored by a drop in freight rates so that they could underbid quarries on other roads who had not known of such a drop. Mr. Montague answered that nothing could be done if the railroad had complied with the law regarding changes in its tariffs. He advised the questioner and his associates that they should have some connection with one of the bureaus that furnish information on changes in rates applying to the subscriber's territory for a very reasonable sum.

Mr. Stull asked what could be done if the change in rates had been made without the notice the law requires. The answer was that a protest should be filed with the Interstate Commerce Commission showing how the protestant had been damaged.

Mr. Montague said further, speaking to all the members, that it was especially important for crushed stone producers to keep track of freight rates, since freight was so large a part of the delivered price, and he thought that collecting and distributing rate



in atrium of the hotel at West Baden, Ind.

information was an excellent thing for local associations to do.

Mr. Rice asked if it was illegal to notify a competitor of a change in one's prices, by sending him a printed list, for example. Mr. Montague replied that there was nothing illegal in this so long as there was no agreement on prices intended.

Efficient Transportation

H. G. Taylor, manager public relations section, car service division of the American Railway Association, addressed the convention Tuesday morning on the subject, "Efficient Transportation." He complained that previous speakers had "stolen his stuff" by talking so much of co-operation and united effort, as the point of his address was that transportation had been made efficient by the co-operation of carriers and shippers.

The first part of his address was a showing of how utterly dependent we are on the network of 265,000 miles of railroads that unites this country so that it functions as a unit and not as a number of jealous and warring sections. If it were not for railroads California could be more easily administered from Pekin, China, than from Washington, except for its local government.

To illustrate how much railroad transportation enters into our daily life, he told of being at a luncheon in Omaha, Neb., when a study was made of the transportation needed to assemble the materials for a salad. Seven or eight states and a foreign country or two had contributed, and 8600 miles of transportation was needed. Applying this method to a complete menu at a Boston dinner, it was found that 12 states and 11 foreign countries had contributed to the dinner and that 80,960 miles of transportation had been needed to bring the materials together.

We consume half of what the entire world producers, which thrills us but also brings us obligations. The power each one of us controls is enormous, for electric energy gives 50 slaves to every man who works. Transportation in China is by coolies, each carrying an average of 65 lb. For every American railway employee 2100 times as much freight is carried.

These conditions have faced us with situations and caused us to seek answers to questions that our grandfathers never dreamed of. As no man's judgment can be better than his information, we are compelled to have team work and co-operation to secure needed information.

The formation of shippers' advisory boards he said was brought about by the railway conditions of 1919 to 1923, which every producer will remember. Some men had to spend all their days trying to secure cars in order that they might serve their customers. The railroads saw something had to be done and eventually the advisory boards were formed so that shippers could say to the railroads, "There's your job," and the railroads would reply, "Here's all the equipment we have to do it with," and then they would get together and figure out some way by which the equipment could be made to do the work. So effective has this co-operation become that 53,714,000 cars were loaded in 1926 with no sign of a car shortage, and almost as many were loaded in 1927. Now it is proposed to retire 100,000 cars, which, Mr. Taylor figured out, would mean a saving of $31,000,000 in first cost, interest, repairs and other charges, a saving which would eventually be passed on to the shipper.

Another method of co-operation that had greatly helped the transportation situation had been the loading of cars nearer to capacity. An increase of only 7/10 of a ton per car had amounted to 721,000 carloads in a year's time.

The interests of all of us are so closely interrelated that the individual does not dare to be ignorant of the effect upon the public of his efforts, he said. Such a saving as that which came from retiring 100,000 cars can only be brought about by co-operation. As good citizens, we do not dare to do otherwise than co-operate in work that is for the benefit of all of us.

Discussion

John Rice led the discussion on this paper. Mr. Rice is a member of an advisory board and explained how the board collected information and passed it on. Regarding the loading of cars, he said that "some of us are inclined to overdo it," and he wanted things made handier for loading to the proper weight so that shippers might not be penalized for overloading more than the permitted 10%.

Loading cars properly and answering questionnaires are the things the shipper can do to increase railroad revenues and thereby lower his transportation costs. At present only 20% to 30% of replies to questionnaires are received. "If you realized what you are getting out of it, you would answer better," he told the members.

Cleaning of cars was another topic he touched upon. There was an obligation on the railroad to furnish clean cars, but it was absurd to ask the railroad to live up to this obligation. So if every receiver would unload his cars cleanly there would be a great saving of time and ultimately a great prevention of waste.

In closing Mr. Rice said be wanted the members to do two things:

Answer questionnaires.

Load cars to capacity.

Meeting of Operating Men, Superintendents and Manufacturers

A meeting of operating men, superintendents and manufacturers followed luncheon on Tuesday afternoon at the same time that the sales group held its meeting. The operating men were presided over by ***A. G. Seitz*** of the Rock Cut Stone Co., Syracuse, N. Y., and the program contained regular papers and informal questions and answers. In opening the meeting Mr. Seitz said he had noted how much talk of co-operation there had been in this convention. He was glad to say that operating men in general were quite willing to co-operate, and it was hard to find a producer today who was reluctant to give out information of his plant methods. In New York state the co-operation among producers on operating problems is 100%.

Truck Operation in Quarries

F. S. Jones, who is production engineer of the General Crushed Stone Co., read a paper on "Truck Operation in Quarries," giving the experience of his company in the two quarries in which they now operate trucks. It has been so satisfactory that they are now putting trucks in a third quarry.

Trucks, he said, are not a cure for all the ills of transportation, neither are they a late development, although it has been only in the last three years that trucks suitable for quarry use and loading 10 to 12 tons were available.

A typical case was that of the Winchester, Mass., quarry of his company, in which, he said, three locomotives and 46 quarry cars used to be employed. They were replaced by three 7½-ton trucks, which could be loaded to 10 or 12 tons. All trucks had automatic rear end doors and the bodies were of the "Won-Way" type, designed by John Rice, Jr., of the General Crushed Stone Co.

Six men were laid off by the change, and this did not include the labor employed in track maintenance. However, it was necessary to keep a man employed on the road for the trucks on the quarry floor. One company is reducing this road work by building a concrete road near the crusher. (This was later stated to be the New York Trap Rock Corp.)

The labor saving alone is not enough to justify a change and the quarry conditions must be right for economical operations. At Winchester the conditions which justified the change were: The length of haul, which was about 700 ft., the position of the crusher below the quarry floor and the fact that no mud-capping was allowed. The reason for making the change was to increase production and this had been brought about by the trucks supplying a more uniform feed. Costs had been lowered but not wholly by the change to trucking.

The average load carried by trucks at this quarry is 11 tons.

At the Whitehaven, Penn., quarry of the General Crushed Stone Co. he said the haul was 600 ft., but the road passed over a 10% grade at one place. The average load is 8 tons, due to the grade, so direct cost comparison cannot be made with Winchester costs.

Two small shovels with 1½-yd. buckets were originally used in this quarry, but they were found to be too small for truck loading and a larger railway type shovel on crawler treads was installed. Crawler treads on shovels, he said, were essential to utilize the full economy of trucking.

The quarry at Glen Mills, Penn., would be the next quarry of the company to be truck equipped, he said, and the trucks used will be of the same size as those in the quarries mentioned.

Haulage costs would be first in the minds of his hearers, but, he told them, he had been unable to get such figures as would make a comparison of any value. Depreciation, for example, had been figured on a five-year life of trucks, but it appeared now that a truck could be made to last 10 years, if $500 a year were spent upon its maintenance. Then there was the chance that a type of truck might become obsolete. The Glen Mills trucks were much heavier than the Winchester and Whitehaven trucks and he thought they would undoubtedly last longer. In his opinion it was impossible to build a truck too strong if it was to be used in a quarry.

Comparing side and end dump trucks he said side dump trucks would have certain advantages if they could be made of the same capacity for the same size. As they are made now they have to be about 18 in. higher for the same capacity. The crusher has to be lower with side dump trucks, as it must be fed from a chute that will narrow the flow. Using end dump trucks without end gates has been tried, but this loses 15% to 18% of the capacity.

The advantage of the side dump truck is that it can proceed in a circle instead of backing in to the crusher. Another advantage is that while a hoist for an end dump truck costs $650, the simple air cylinder needed for a side dump truck costs $200 to $400. But the side dump truck, he pointed out, had a serious disadvantage in that the springs and chassis had to support 75% of the weight on one side when dumping.

Regarding tires he said that one tire maker was experimenting with a rubber tire with steel sheathing for quarry use, but he understood that the results were not very satisfactory. He thought that the chain drive was preferable, but in answer to a question he admitted he knew little of other drives, so perhaps other drives might be as satisfactory.

He thought the best arrangement at the crusher, where conditions would permit, would be to have a hopper above the crusher so that the truck could dump and drive away instead of remaining to act as a feeder for the crusher.

Summarizing, he said that the length of haul might get too long for trucking, but he did not know what the limit was. Grades added rapidly to the cost of trucking.

The advantages of trucking as he saw them were: 1. Greater mobility. 2. Simplication of management. 3. Fewer delays. 4. Elimination of mud capping. 5. Elimination of track shifting and track maintenance. 6. A better safety factor, since there is less hazard to men on trucks than to men on the ground near sliding banks. 7. Trucks may be taken from the quarry and used for stripping and work about the plant.

In spite of these advantages he was convinced that it was not economical to change from rail transportation except to obtain increased production and then only when conditions were right. Every quarry operator should make a careful study of all his conditions before deciding to change to trucking.

The discussion of this paper was quite informal. It was begun by ***A. S. Lane,*** Meriden, Conn., who asked what amount the trucks mentioned could haul 700 ft. Mr. Jones said the trucks were hauling 200 to 250 tons per hour and could haul more.

Another questioner wanted to know how the use of trucks avoided mud capping and Mr. Jones explained that the trucks and shovel on crawler treads could move to a part of the pile where the boulders were not tightly wedged in the fines and so attack the pile better.

Answering the question as to how big a shovel dipper should be used for loading trucks, he said that his company was using what was called a 3-yd. dipper, although the actual water level measure was about 2⅝-yd.

Discussion of Vibrating Screens

D. W. Yambert, an engineer of the France Stone Co., Toledo, Ohio, read a paper called "Analysis of Relative Value of Various Vibrating Screens." He opened it with the statement that there was no generally accepted opinion as to which was the best type of vibrating screen or the best way of operating such a screen. One manufacturer said the screen should "whip," another said that "whipping" should always be avoided. One manufacturer said the material should rub on the cloth, while another said that rubbing wears the cloth unnecessarily.

He divided vibrating screens into four classes according to the manner in which the vibrating motion was secured. These were: 1. Vibrations from an unbalanced pulley. 2. Vibrations from an eccentric having a positive throw. 3. Vibrations from electrical impulses. 4. Vibrations from cams. He gave examples of each of these, mentioning the sizes of material for which they were adapted and the styles in which they were made. Lantern slides were used to illustrate the action of some of the screens, especially the electrical vibrators.

He gave as his opinion that the design of a vibrating screen should have the following features:

1. The throw should not exceed two or three times the diameter of the largest particle.

2. For fine material, high speeds and low force of vibration should be used and for coarse material low speeds and stronger vibrations should be used. This would lead perhaps to the design of separate types for fine and coarse screening, each adjustable for work within certain limits of sizes.

3. There is no advantage in rotation over reciprocating motion or vice versa. Rotation which throws the grains back up the screen keeps the particles in contact longer with the screen cloth, but the same result, he said, could be accomplished by running the reciprocating screen with less slope.

In the informal discussion which followed the question was asked as to how the moisture content of the rock affected the work of the screen. Mr. Yambert said that all the quarry sent to the plant in wet weather was put through the vibrating screens which he had tested, but the effect of moisture was not determined.

Another questioner wanted to know the speaker's experience with screening large sized stone. Mr. Yambert said he did not believe vibrating screens had developed to where they could be advantageously used for scalping. This was different from the experience of John Rice and F. F. McLaughlin, both saying that they were using vibrating screens on large sizes. Mr. McLaughlin said one such screen was taking the product of a 30-in. secondary crusher which had pieces as large as 5x7-in. and screening it successfully. The screen worked best when it was heavily loaded. The openings in the screen were 3-in. square.

Question Box—Roll Grizzlies

The first question from the question box was as to the value of the roll type of grizzly as a sizing screen.

C. G. Knoblauch of the National Lime and Stone Co., Findlay, Ohio, said he had eliminated such grizzlies for sizing except for material between 2¾-in. and 4-in. He was asked why and replied that the material carried over.

Max S. Lambert of the Robins Conveying Belt Co., said that his company made both roll grizzlies and vibrating screens. He had found the roll grizzly to be 95% to 100% efficient on sizes down to 2½-in. and was using them on material as small as 1¾-in., handling 150 tons per hour. A 9-shaft outfit will handle more than 200 tons per hour. W. L. Sporborg wanted to know if this meant moist stone. Mr. Lambert said he did not think moisture in the stone affected the work of a grizzly of this type.

Blasting Heavy Rock at Top

The second question was, "What is the best method of shooting a heavy stratum near the top of a ledge running 40 ft. to 50 ft. high?"

The chairman called on ***S. R. Russell*** of the duPont company to answer this question. He explained that a churn drill hole could not be loaded heavily near the top, so, in his opinion, the best method would be to put down tripod drill holes between the churn drill holes. These could be fired with the primary shooting. The tripod drill holes could be sprung, but he did not consider it good practice to spring these small holes in limestone.

A number asked Mr. Russell how he would spring well-drill holes. He answered that

the operator would have to "feel his way along" until he knew the rock. Sometimes as much as 200 lb. of powder was used to spring a 150-ft. hole.

He was asked how much he would gain by this and said that it was sometimes possible to use 1000 lb. of powder in this way without more than an 8-ft. rise. For springing holes it is the custom in some places to use 75% powder and water tamping and this works well.

Shooting Holes in Rows

The third question asked whether it paid to shoot holes in one, two or three rows in ledges 40 ft. to 50 ft. high.

The chairman called on ***J. Barab*** of the Hercules Powder Co. to answer this, and he said the answer would depend upon the formation and the method of operation. Three rows, he said, were usually satisfactory. They give more crushing action than a single row, as the explosive works in more than one direction.

With a very hard rock he thought that one row would be better, as three rows would give too many boulders buried in fines.

A member asked if it was advantageous to shoot one row at a time in shooting three rows. Mr. Barab said it was sometimes advantageous to do this in heavy rock, as shooting one row first left a place for the row behind to break into. Another asked if shooting one row at a time did not make more boulders and was answered that it did, but loading conditions might be better with a face 40 ft. to 50 ft. high.

The remainder of the afternoon was taken up with a motion picture exhibit covering quarry operations, furnished by the Hercules Powder Co.

Salesmen Discuss Selling and Service

Under the chairmanship of ***H. B. Allen,*** General Crushed Stone Co., Philadelphia, Penn., the executives and salesmen of the various member companies held an interesting session.

Paul B. Reinhold opened the discussion with some remarks on the "Ethics of Competition." He handled truisms and axioms of business, such as "Don't try to undersell your competitor; sell your product on its merits; don't knock; let your conscience be your guide," with a refreshing directness.

Thos. A. Lannigan, General Crushed Stone Co., Winchester, Mass., said most of his competition now was coming from contractors' construction plants, and advised legitimate producers "to stand pat."

Geo. E. Schaefer, General Crushed Stone Co., Rochester, N. Y., started a discussion on f.o.b. plant prices vs. f.o.b. destination prices, which showed that practice and sentiment generally is very much in favor of the f.o.b. plant price.

Mr. Schaefer, who is president of the New York State Crushed Stone Association, also contributed a discussion on "Should a Local Association Advertise?" He said, of course, that he believed in advertising, but, finances considered, pages of newspaper space were out of the question. Another disadvantage in using local newspaper space is the danger from discrimination—all the papers could not be used, and the use of some and not others is dangerous. The most valuable advertising the New York producers have received is from their monthly meetings, news of which are published in local newspapers.

A. S. Owens, Peerless Quarries, Inc., Utica, N. Y., brought up the need of association publicity material of a less technical character than that now distributed for use in educating township highway officials.

Col. E. J. McMahon, St. Louis (Mo.) Quarrymen's Association, described his postal card method of publicity, which has been eminently successful.

J. R. Boyd, secretary, National Crushed Stone Association, reported on the kind and character of the literature prepared by the association and the extent of its distribution thus far. Some 15,000 copies of A. T. Goldbeck's three engineering bulletins were mailed in 1927 largely by the member companies to their own mailing lists. Several speakers referred to the exceptional value of these bulletins and the desirability of their greater distribution.

W. Scott Eames, New Haven Trap Rock Co., New Haven, Conn., said successful selling is a matter of personality—that a salesman with personality is the best advertisement for any producer. To illustrate his point he gave some reminiscenses of his own early experience as a furniture salesman.

A. L. Worthen, Connecticut Quarries Co., New Haven, Conn., described at some length "The Storage of Stone at Service Plants as a Means of Increasing Sales." This is the third successive year Mr. Worthen has described the sale of his product through service plants in cities and suburban localities far removed from the quarry, yet the interest was keener than before. He said that such service plants are the answer to the objection being raised everywhere to the operation of quarries near cities. Masonry supply dealers will seldom put in the necessary handling equipment, but in most instances they are glad to avail themselves of the new supply and sell material from the producer's service plant in preference to carrying their own stocks.

It is very necessary, Mr. Worthen said, to carry a complete line—stocks in 5 or 6 different sizes of stone. The dealer is seldom equipped to do this; moreover the dealer demands a larger profit on this investment than the producer, who is satisfied with his profit on the production of the stone at the quarry.

The service plant idea is good only in the larger cities and in fast growing suburbs. Architects soon become very much in favor of it because of the dependable source of good clean coarse aggregate; the difference in price compared to inferior local aggregates is not a serious factor in the ordinary amounts specified by architects. It is important of course that the material served be really good, clean, well-graded material.

The service plant is the answer, Mr. Worthen said, to the demand for immediate delivery that is becoming universal in the building material industry. He said the present methods in the crushed-stone industry do not fit in with this progress in every other line. Moreover, the service plant uncovers an astonishing amount of small order business that the majority of quarry operators do not yet know the existence of.

Local salesmen are necessary, but to a large extent the material sells itself; the consumers have been able to discover many advantages that the producer himself overlooked. Deliveries are made by hired trucks. The capacity of the service plants is from 1200 to 1800 tons; five sizes are carried in as many bins. The price of the material is the plant price plus the freight plus a service charge. These service plants do not handle large orders of material in car-load lots. Such orders, whether in the locality of the service plant or not, are sold on an f.o.b. plant price basis, and the contractor does the unloading.

Each service plant requires the services of a superintendent, or shipping clerk. The reason the operation of the plant is not intrusted to local building supply dealers is that the producer wishes to retain complete control of prices. It is proposed, Mr. Worthen said, to allow dealers a commission of perhaps 5c. a ton for sales made through them, as such a commission is justified by the dealer carrying these accounts.

L. C. Bonnell, F. R. Upton, Inc., Newark, N. J., described a concrete-mix batching installation that he has installed. It was originally built to meet the requirements of a large contract job, where batched material was supplied in compartment trucks. It was soon found, however, that local building supply dealers were very glad to take the material, paying the same price as anyone else. To this price they added their own profit.

A. T. Goldbeck, director, bureau of engineering, National Crushed Stone Association, spoke on "The Bureau of Engineering and Sales." With his usual clearness and facility of expression he explained how the data in the engineering bulletins on the bulking of sands and the water-cement ratio can be used for selling crushed stone. The bulking of sand, if not allowed for, means a deficiency of sand, which causes a harsh-working concrete where crushed stone is the coarse aggregate, and a smaller volume of mix, as compared with gravel concrete, because of the larger percentage of voids in the crushed stone. Likewise, the water-cement ratio theory affected crushed stone aggregate adversely because for the same workability the angular fragments of crushed stone require more water in the mix than rounded pieces of gravel.

If cross-bending strengths are established as a criterion for road-pavement concrete, as Mr. Goldbeck believes will be the case, crushed-stone concrete may prove to have definite properties as compared with gravel concrete. Other subjects discussed were the advantages to be expected from a research laboratory, and new bulletins are in the making on bituminous type pavements. Mr. Goldbeck said he recognized the desirability of putting some of this technical literature in briefer form, for the use of contractors and local highway authorities. This has been done in some instances; a chart showing how to build crushed stone shoulders for any type of pavement was offered as an example.

Separate Sizes of Coarse Aggregate for Concrete

R. T. Giles, chief engineer, Blaw-Knox Co., Pittsburgh, Penn., spoke on "Separate Sizes of Coarse Aggregate for Concrete" and said in part:

"The subject of separating coarse aggregate into several sizes for the manufacture of concrete is of extreme importance and is rapidly attracting more and more attention. The need arises from the segregation which takes place in the handling of material after it leaves the quarry and before it enters the concrete mixer.

"A few examples of this segration and how it occurs will illustrate the point: On a large construction job the materials were assembled before the actual concreting started. The contractor installed modern equipment to control the cement, the sand and the water. The coarse aggregate had been stored adjacent to the proportioning plant in one large stock pile. As is inevitable in such cases, the coarser particles remained on the outside of the pile, while the core contained the small particles. When a batch containing the coarse particles was mixed, the consistency of the concrete was of such a wet nature that the sand and cement would run away from the coarse aggregate. On the other hand, when a batch containing mostly small particles was mixed, the concrete was of such a dry, mealy consistency that in some cases it was practically impossible to get the batch out of the mixer. By extreme vigilance on the part of the mixer operator this condition was helped, but it was impossible to produce the highest class concrete under the circumstances. All the benefits which should have been derived from modern equipment were lost by the segregation of the coarse aggregate.

"On a large job in Chicago the engineer in writing up the job suggests that it would be wise for specifications to be written for concrete size coarse aggregate (¼-in. to ¾-in.) until such time as satisfactorily graded stone could be secured. Such a suggestion as this was caused by the inability to secure coarse aggregate of a satisfactory gradation. If a suggestion of this kind should actually be carried out, the effect upon the quarry industry can easily be judged.

"An experience on a road job several years ago will illustrate how segregation in its worst form can occur. The coarse aggregate actually entering the mixer might have been thought to have been separated into sizes, due to the segregation which had taken place in the handling. Observation of the material at the producing plant, as it was loaded, showed the material to be satisfactorily graded as it entered the cars. Upon investigation these were the conditions found: The material was loaded from the bin into the car by chutes with the usual small amount of segregation. All the cars, which were hopper bottom, were delivered on a trestle at the unloading point. The material flowed through the bottom of the cars to a bin under the trestle and from the bin into trucks to be hauled to a stock pile at the job. When this material entered the mixer, the segregation had so changed the appearance and utility of that material that it could hardly be recognized as the same material which had been loaded at the producing plant. While this is an unusual case, it illustrates the point and gives a picture of what happens to a greater or less degree on every concrete job.

"No doubt many of the producers feel that, since it was not the producer's fault, he is not interested. Let's consider what happened and see if the producer is interested: Very shortly afterwards the maximum size of coarse aggregate for roadway work was reduced from 2¾ in. to 2¼ in. This change was not, of course, wholly the result of the one job cited, but was due to results caused by segregation.

"There is another angle from which the producer is vitally interested, and that is rejection of material after it arrives on the job, due to improper grading and excessive dust. With stone shipped in three sizes, the possibilities of rejection from improper grading will be nil. Under present conditions, if three cars were shipped containing excessive dust, all three cars would be rejected, whereas if the same stone were shipped separated into three sizes, all the dust would most likely be in the car with the small stone, and that one car would be rejected.

"Just recently there appeared an article showing the saving by designing a mix for the use of local material on a roadway job. This material did not meet the specifications, but by the addition of more cement the local material was used and a considerable saving was the result. The material was deficient in large size particles. Had separated aggregates been required in these specifications, the contractor could have used his local material and supplied the deficient sizes from commercial plants. If this procedure had been followed, the commercial plants would have furnished approximately 50% of the coarse aggregate on this job, whereas under the procedure which was followed, the commercial producer lost the whole job.

"There will always be the competition of local material. But by the encouragement of separated sizes of coarse aggregate, the deficiency will be filled by the addition of proper sizes of aggregate instead of by the addition of more cement.

"It might be well to consider some of the methods now in use to prevent segregation: California requires the coarse aggregate to be shipped in two sizes and definite amounts of each size measured before entering the mixer. Iowa, as I understand it, has reduced the maximum size and requires that stock piles be built in layers and limits the height of the stock pile. Other states have done likewise, and while this no doubt helps the situation, it does not correct it.

"The most satisfactory specification using separated sizes is that used by the state of North Carolina for some special experimental jobs now under construction. The maximum size in North Carolina is 2¼ in. Unfortunately, it was not thought practical to allow a larger size for this particular work, as it was feared that some of the producers would have jobs under the 'Special' specifications and under the regular specifications at the same time. In such case, a maximum size of 2¼ in. for one specification and 2¾ in. or 3 in. for the other specification could cause considerable trouble.

"Should the experimental work prove satisfactory, it will be of interest to stone producers, and for that reason a brief outline of those specifications is given:

"In spite of the fact that a 1-2-4 mix was regularly used for roadway concrete, it was felt that by using inundation to accurately control the fine aggregate and to separate the coarse aggregate into three sizes and measure each size, the mix could be increased to a 1-2-4.65 and a concrete of suitable workability secured. This proved to be the case. The idea of resorting to such a specification was primarily economic, and unless a concrete equal in value to the concrete obtained under the 1-2-4 mix is obtained, there will be no economic advantage. Had the maximum size of the coarse aggregate in these special specifications been increased to 2¾ in. or 3 in. at the same time that the mix was changed from 1-2-4 to 1-2-4.65 it is possible that even a better quality concrete than that of the old mix might have been secured.

"By increasing both the size and volume of the coarse aggregate, using the same cement and fine aggregate, the fineness modulus of the aggregate is increased and a stronger flexural strength concrete should be secured. If the flexural strength will be increased by the increase in the fineness modulus and at the same time a concrete be secured which will absorb less water, it is hardly conceivable that this idea and these principles will not be followed, though perhaps not in the exact form now being tried out.

"Should this idea prove its merits, it seems reasonable to suppose that it will be included in other specifications. In this case, quarries will more than likely be asked to furnish stone to be measured in separate sizes.

"There is no doubt that a specification as

outlined would cause some little disturbance in the operation of a quarry, but where once the necessary changes had been made, the benefits should greatly offset the temporary inconvenience. If a successful method can be found to use larger size coarse aggregate for roadway concrete, the aggregate producers will receive a larger benefit than any of the interested parties, except the general public. The increase in the maximum size from 2¼ in. to 3 in. would increase the production with no additional crushing expense. It also would reduce the percentage of screenings in relation to the output."

Discussion

In answer to questions by ***W. L. Sporborg,*** Rock-Cut Stone Co., Syracuse, N. Y., and ***Dr. H. F. Kriege,*** France Stone Co., Toledo, Ohio, it was developed that the same fine aggregate was used throughout the experiments. The fineness modulus was 2.50 and a portland cement giving 300-lb. strength in 28 days was used. The water-cement ratio was not determined. There was an increase of water required with an increase in the amount of crushed-stone aggregate, but the resulting concretes gave greater strengths.

J. F. Schroeder, Linwood Cement Co., Davenport, Ia., described the Iowa state highway department requirements to prevent segregation of stone. The impression exists there that the contractors' costs are less when smaller sizes of stone are used.

A. T. Goldbeck, director, bureau of engineering, National Crushed Stone Association, pointed out the significance of Mr. Giles' conclusions to producers. It will mean a radical change in the present methods of shipping crushed stone.

C. N. Connor, chairman, committee on low cost improved roads, Highway Research Board, Washington, D. C., spoke briefly of the segregation in stock piles of mixed sizes. He said he believed shipping in different sizes, to be proportioned on the job, would benefit the crushed-stone producer by placing the responsibility on the contractor.

How a Mineral Aggregate Association Can Co-operate in Furnishing Specified Materials

H. S. Mattimore, engineer of materials of the Pennsylvania State Department of Highways, read a paper at the Wednesday morning session on "How a Mineral Aggregate Association Can Co-operate to Assure the Furnishing of Specified Material." The paper reproduced in full follows:

"In highway construction as in well controlled construction of all kinds, crushed stone is purchased under specifications. The producer in accepting the order obligates himself to furnish material which will meet the requirements. From this standpoint, naturally, the purchaser expects this as a matter of contract agreement.

"I would not be surprised if the above premise is an old story to individual producers, in that engineers as a class respect their specification requirements and as a general rule insist that the contractor and producer are required to meet them. When materials are received on important work which do not meet the specified requirements, it is an economic loss for all parties concerned, therefore co-operation to correct the occurrences of this condition should be a profitable undertaking for an individual producer or an association of producers.

"From the number of trade associations formed within the past ten years, we are justified in calling this an age of association. This uniting of efforts along various lines is advantageous to the individual producer or the association would not survive. It can be seen that considerable advantages may be gained by skilled advertising, intelligent promotion, and expert supervision of investigations to solve general producing problems or increase the market for the product. These are worthy motives for the uniting of efforts, if carried out in an ethical manner, and will have the respect of all engineers supervising construction. Furthermore I believe these engineers will readily co-operate with an association if they are assured that problems will be approached from an engineering standpoint.

"Crushed stone, as received at destination, is tested for grading, and examined for cleanliness, foreign coating, excessive stone dust, and existence of objectionable material, such as shale. If the material does not meet the specified requirements the engineer or inspector has no alternative but to reject it. We know it is commercially possible to produce and furnish stone to meet certain specification requirements from the large tonnage received which is acceptable.

"Inspection of different quarry faces and crushing plants furnishes considerable information relative to the sources of these rejections; for instance, quarry faces with mud seams usually explain the cause for dirt coating on the crushed product, especially if it is prepared during wet seasons. Care in selection may remedy this condition to some extent, but the real cure is to wash the product. Crushed stone washing at some quarries must be an economic procedure, as one large corporation I have in mind, after having tried the process at two plants, is now preparing to install the third one. The company is one that I know has made a detailed study of costs, and is in a position to demonstrate the practicability of such installations.

"Another cause for dirty stone is careless stripping. Although this is not a general fault in well-run operations it still exists in plants which along other lines seem to be run on a business basis.

"There are many causes for poorly graded material. It may be caused by improper spacing of crusher jaws to produce the required sizes, improper screening due to the length or pitch of the screen, and finally by segregation in loading. I realize these are details which are or should be familiar to all producers, but we do know that they are not always well looked after, judging from conditions encountered when inspecting plants, and I might state further that such faults are not characteristic of the small producers only.

These conditions which are causes for rejections of the finished product, accompanied by a financial loss to producers and at least delays to the constructors, should be corrected as a straight business proposition. It certainly is not good business to depend upon the construction inspectors to rectify them. It may be relevant at this point to discuss briefly inspection at source versus inspection at destination. I realize inspection at the plants is favored by many producers. Some of them assume that this system would relieve them of considerable responsibility. Under some conditions inspection at the source is feasible and apparently works out well, but such inspection is more applicable where a large proportion of the shipments comes from a few sources. In a state like Pennsylvania, where 135 crushed stone and 82 sand and gravel producers are furnishing material for highway work, inspection at source has been found impractical. Producers in the state realize it and are assuming the responsibility for furnishing proper materials, many of them having assigned their own inspector to sample and test material prior to shipment.

"Getting to the meat of our subject, just how an association of this kind can co-operate to assure quality aggregates, in the first place, in order to protect the association and the best class of individual producers, some quality requirements should be necessary for membership. Inspection should be made of the source of supply that the proposed member is to work and the efficiency of the plant relative to producing the desired material, along with general investigation of his business integrity. You can readily see how a requirement of this character would tend to raise the status of any organization.

"The association should have a sufficient force of technically trained men to advise producers relative to installation of screens of proper sizes and general correction of conditions in the quarry or plant which affect the finished product. Do not confuse them with so-called trouble shooters sent out by producers to examine a product at destination, which has been rejected. Make provisions to prevent rejection by investigating the trouble at the source.

"You are about to establish a research laboratory and organization. This is an excellent move and should prove a profitable one, but remember, research is not a procedure that produces results overnight. As problems are solved, or new uses for material are initiated in the laboratory, provisions should be made to see that facilities are available to put them into practice. Many excellent ideas in the use of material have been discarded, due to improper supervision of the application. For instance, different types of stone roads in some localities

have been condemned. Is this due to poor construction or to the type of road? Perhaps thorough investigation might show that the limiting of the field for bituminous penetration macadam has been caused by improper materials or poor construction.

"The Portland Cement Association in recommending concrete surfacing foresaw that poor construction might condemn this type of road, and they made provisions to supervise inspection of construction to avoid it. There is no doubt but this was a large factor in the great favor which this type of road is receiving at the present day. Such detailed inspection as that organized by the cement association might not be an economic procedure for your association at present, but I do believe some general field inspection would in time prove to be a profitable undertaking.

"We have heard considerable talk relative to standardization of specification for stone sizes. Probably there is a field for this, within limited areas, but from a production or any other standpoint I can see little or no advantage. In fact it may be a waste of effort to try to obtain national standardization. In some types of construction stone grading should be governed by stone quality. The main economic gain to be obtained by standardization would be in the case of the one producer furnishing material to several different organizations.

"I have aimed to give you the viewpoint of engineers who have the responsibility for quality construction in public work. The producers also have responsibilities which they must assume. Aggregate production should be placed on such a high basis that there should be little or no necessity for construction engineers or inspectors to advise relative to plant methods to produce specified materials. Expert advice of this kind could suitably be considered a field for the association.

"Definite practical specifications intelligently interpreted, with fair, skillful inspection on the part of construction engineers, accompanied by skillful plant operation in preparing materials from suitable sources, on the part of the producer, is the basis for real co-operation."

Mr. Mattimore concluded his remarks by stating that in A. T. Goldbeck the association had a man whom engineers could rely 100%.

P. J. Freeman, chief engineer, bureau of tests and specifications, department of public works, Allegheny County, Penn., said, in discussing Mr. Mattimore's paper, that the National Crushed Stone Association had begun to co-operate with public officials and engineers when it procured the services of A. T. Goldbeck and that this was a long step in co-operation. He said an association should fight for quality in the output of all its members. He gave as a specific example an experience with gravel on an Allegheny County highway, where the local sand and gravel association was able to bring such pressure to bear on a local non-member producer that the original poor material supplied was replaced with quality material, and the producer who furnished it was induced to become a member of the association as well. Mr. Freeman agreed with Mr. Mattimore that plant inspection was impracticable because of the difficulty in procuring competent inspectors. Every producer should have some man in the plant organization to control the preparation of the material. It is a proper function of the National Association to train such men for its member companies.

Mr. Freeman said the intelligent user did not care how the material was prepared, whether it was screened through round holes or square ones, so long as it met the specification requirements. The specification requirements call for testing sieves with round holes, but that does not mean the plant's screens must have plates with round holes. He said no user could presume to prescribe the screening equipment, or other details of the plant operation.

Inspection, Mr. Freeman said, should begin at the quarry face. If the product cannot be brought up to standard it should be discarded entirely and not palmed off on some township or local authority which is not able to distinguish between good and poor material. Referring to the impossibility of making good aggregate out of some kinds of stone he said that an article soon to be published in Rock Products by G. F. Loughlin, geologist, U. S. Geological Survey, will show conclusively that some stone aggregate passing every requirement but the sodium sulphate test for soundness, was the cause of some grievous concrete failures.

An excellent suggestion of Mr. Freeman was the tagging of cars at the quarry plant by the plant man responsible. He said a car officially tagged "No. 4 state highway stone," for example, would very likely be accepted anywhere with little question. He has never yet had occasion to reject stone so tagged. The plant man knows how to interpret specifications as well as any inspector, and where he feels the responsibility for quality no further inspection is generally needed. The same care should be taken when one producer is helping another in supplying material.

Research in General

C. N. Connor, chairman, committee on low cost improved roads, Highway Research Board, Washington, D. C., made an extemporaneous address, partly devoted to facts and statistics in connection with the recent Cleveland Road Show, and partly to a discussion of research in general. He pointed out that research was not necessarily confined to facts developed in the laboratory; there can be researches of men as well as of materials. Chas. M. Upham and Otho M. Graves, he said, were examples of researchers in men—were high-powered organizers of men and of industry. One of the outstanding developments in highway construction in 1927, Mr. Connor said, was the intermediate type road.

Railway Maintenance Problems

J. V. Neubert, chief engineer, maintenance-of-way, New York Central R. R. Co., gave an illustrated talk on the history and development of railway track structures generally, with special reference to the progress made in conservation of man-hours in handling and placing track materials—a far more important consideration than the conservation of the materials themselves.

Meeting of National Agstone Association

The National Agstone Association held its regular annual meeting after a group luncheon Wednesday. President ***L. E. Poorman*** opened the meeting with a brief survey of the year's production and sales, which he said had been about normal. There was an increased use of limestone in Michigan which he said was due to the work of the Michigan state agricultural college.

"The Agstone Industry from a Railroad Standpoint" was the subject of a paper by ***E. J. Leenhouts,*** general agricultural agent of the New York Central Railroad Co. The paper, which was read by President Poorman, was largely a history of the campaigns which the railroad has carried on to increase the use of agricultural limestone.

He told the producers that in order to increase their sales they must bear three things in mind. The first was the quality of the product. "Keep the big lumps out," he advised. The next was service. The producer should secure good local agents and should put up local bins if they are needed. And the third was a stronger selling campaign. Most salesmen are not selling; they are only taking orders. He advised producers to get in touch with other agencies than dealers as a method of locally educating farmers.

He said that the railroad was putting on a campaign for a greater legume acreage in one county in each state. The New York Central is behind what it considers to be missionary work of the highest order. "The agstone man is sitting on the doorstep of the farmer's house of prosperity holding the key, and the farmer is coming down the road to meet him," he said in conclusion.

Dr. Bear's Address

The principal address of the day was delivered by ***Dr. Firman E. Bear,*** director of soils department, Ohio State University. It was a rather deep discussion of the difficulties of assigning certain values to agricultural limestone from laboratory work.

Dr. Bear began by stating that he had just come from a meeting of fertilizer men in which he had finally succeeded in convincing them that so many ratios were not necessary and that 12 standard ratios had been adopted in place of the sixty-odd that had been in use. Now he hoped that it would be possible to standardize limestone in a satisfactory way.

He reviewed what had been done in that direction, noting especially the Ohio law which defined "ground limestone," "limestone meal" and "screenings." But the law was defective in that it did not consider all the factors.

The neutralizing power of agstone is evaluated by comparison with $CaCO_3$, and it seemed to him that it would be well to retain this. With pure substances, $CaCO_3$ would be 100%, CaO 179% and dolomite would be 108%. But the matter of fineness and solubility had to be taken into account. Dolomite with less solubility had about the same neutralizing power as high calcium stone, all conditions being equal, per unit of time. Hence fineness which increased rate of solution was more important with dolomite.

For evaluating fineness, Dr. Bear thought a surface area comparison the most advantageous. Taking 100-mesh and finer as 1, 48-mesh would be ½, 28-mesh ¼, 14-mesh ⅛, 8-mesh 1/16 and 4-mesh 1/32 in value. He illustrated how this could be applied by some examples.

Investigation had shown that in Ohio the surface area calculated in this way multiplied by seven would be about the delivered price per ton, with $1.50 added for sacks.

The remainder of the paper was given to the difficulties of evaluating limestone for some period in the future, as at this end of two or three years. Dr. Bear showed it was next to impossible to do this for anything more than a laboratory experiment, in which everything was under control, because of the number of variables that had to be taken into account.

In the discussion which followed ***Harry Brandon,*** Ohio Marble Co., Piqua, Ohio, said that the whole matter of standardization should be considered from the standpoint of the manufacturer of agstone. The only thing the manufacturer can control is the fineness and he thought that the standardization should be based on that. Other things can be correlated with this to make an efficiency factor, if this is desired. The farmer can buy according to this efficiency factor, 100%, say, for quick action and a lower percentage for slower effect.

He realized that standardization was coming soon and he thought that agstone men should get together with state universities to determine how standardization should be effected.

Bert Keller, Dolese and Shepard Co., Chicago, was asked for Illinois' experience and he said that Illinois farmers favored a somewhat coarser material than those of other states. They wanted the effect of liming to last and he spoke of one field to which three tons per acre had been applied that showed no acidity after 19 years.

Dr. H. F. Kriege, France Stone Co., Toledo, Ohio, said that at present we consider only two sides of a triangle in evaluating limestone, total neutralizing power and fineness. There was a third, the rate of solubility of the stone itself, which ought to be taken into account since it varied so widely. He said that the France Stone Co. had accumulated a great many samples of Ohio limestone which he was testing for physical and chemical characteristics and information on the rate of solubility of these would later be available.

Harry Brandon, commenting on Dr. Kriege's remarks, said that this triangle might be all right as a measure of efficiency, but that manufacturers should be careful that standardization did not become too complicated.

John Laughlin, Bedford Stone Products Co., Bedford, Ind., was asked for Indiana's experience. He said the state had no limestone law, but farmers usually preferred a moderately fine product. He gave some figures from the Jennings' farm experiments which tended to show that the greatest profit came from the use of 10-mesh and finer material, taking the original cost of the stone into account.

Judson King, Carbon Limestone Co., Youngstown, Ohio, closed the session with a discussion of the whole matter of standardization, and the difficulties of applying it. He spoke of Mr. Brandon's idea of an efficiency factor and reminded his hearers that while it might be possible to make up for differences in solubility by finer grinding, finer grinding would cost money.

The directors elected for the year are: L. E. Poorman, F. J. Colgan, H. C. Krause, J. C. King, Harry Brandon, W. H. Margraf, N. G. Farber, K. C. Ruedebusch, C. W. Fuller, Ellwood Gilbert and William Comstock. A meeting of the directors was held at the close of the session.

Accident Prevention Conference

The accident prevention conference began with a demonstration in first aid by a specially trained quarry crew, from the Mid West Crushed Stone Co., Greencastle, Ind. These men were trained and captained by ***W. T. Lacy,*** in charge of one of the U. S. Bureau of Mines first-aid rescue cars.

The meeting following was under the chairmanship of ***N. S. Greensfelder,*** Hercules Powder Co.

R. P. Blake, engineer, Independence Bureau, Philadelphia, Penn., spoke on the ABC's of accident prevention. He divided his subject into four main divisions: (1) Extreme financial advantages; (2) building up of morale; (3) causes of accidents are myriad, and (4) accident prevention records of many successful organizations show accidents can be reduced to practically nil.

According to recent statistics of the Travelers Insurance Co., Mr. Blake said, the indirect cost of industrial accidents is 4½ times the direct cost; an accident is defined as anything that interferes with the orderly procedure of work.

The path to safety is through the minds of men; the moral is to make the men one-minded in regard to safety. And if they are one-minded on safety they may be one-minded in other directions in which their interests and their employers' interests are one. There is a direct relation between costs of production and accident records.

The causes of accidents are myriad. Slipping and falling, and falling objects are the most common causes in all industries. The principles of good organization are the same everywhere; they consist of (1) intelligent, forceful direction on the part of the executive; (2) everlasting care; (3) no blind spots in one's vision of what can happen and may happen.

Mr. Blake said modern business men were coming to consider it just as essential to employ outside experts to make periodical examinations of their industrial hazards and measures for accident prevention as to employ auditors to check their financial status. In the crushed stone industry there is tremendous room for improvement, and an opportunity for financial returns accordingly.

W. H. Weitknecht, general superintendent, Lehigh Portland Cement Co., Mitchell, Ind., made a splendid address confirming much that Mr. Blake had put forward, from the angle of a practical operating man. He said accident prevention was an evolutionary development. First it was every man for himself, etc.; unguarded places, unguarded machines; then came guards for places and machines, but always with the idea of speeding up processes and production. This led to machines nearly automatic in operation, but still accidents did not decrease. At last the human element came to be recognized and progress was rapid.

The cause of accidents, Mr. Weitknecht said, is carelessness. To overcome this the plant safety committee was born. Why do some safety committees succeed in their purpose and others fail? The answer is the management; it must be active in directing, or in supervising or in both. It is no longer possible to differentiate between the responsibility of the management and the responsibility of the workmen. The management must assume the major responsibility; where the management leads, the employes will follow.

Safety committees are especially valuable in the absence of an all-time safety engineer or manager. In describing in some detail the organization and work of safety committees, Mr. Weitknecht emphasized the part played by a tactful leader. The committee's work is corrective and preventive; corrective to investigate accidents to prevent repetitions; preventive to look for unsafe practices, for unsafe practices are the cause of 75% of all accidents. The all-important thing in accident prevention is the cultivation of safe habits. The supervising management must assume the responsibility for this.

Malingering has been found the cause of much undeserved lost time from trivial accidents. This can be cured by a visiting committee of employes, who personally investigate the cause of such absences; also

by giving the men an occasional day off for hunting or fishing or what not, provided they don't all ask for it at the same time.

W. W. Adams, supervising statistician of accident statistics section, U. S. Bureau of Mines, Washington, D. C., traced the history of quarry accident prevention and noted the increasing interest in it. Most crushed-stone quarry operations are eligible for two prize trophies provided yearly by the *Explosives Engineer*—one awarded to any quarry employing not less than 25 men in the pit, and one to any member company of the National Crushed Stone Association, regardless of size of operation. All those who complete these competitions are given a relative rating by the U. S. Bureau of Mines in a confidential form, so that they derive some benefit if they do not win a prize.

In 1925 the accident rating of portland cement company quarries entered in the contest was very appreciably better than that of commercial crushed-stone quarries; but in 1926 these conditions were reversed and the commercial crushed-stone quarry entries got a considerably better rating than cement quarry operations.

Mr. Adams announced the winners of the National Crushed Stone Association's safety contest for 1926 as follows:

Louisville cement rock quarry, Speed, Clark county, Indiana, operated by the Louisville Cement Co. Operated 326 days in 1926 and worked 227,750 man-hours. Employs 78 men. Had no accidents during the contest year. Each employe worked about 2,934 hours during the year. The quarry has a record of 865 days without a lost-time accident. Average hours worked per man, 2934.

First Honorable Mention—Monroe limestone quarry, Monroe, Monroe county, Michigan, operated by the France Stone Co. Operated 281 days in 1926 and worked 70,170 man hours. Employs 25 men. Each employe worked about 2810 hours during the year. Had no accidents.

Second Honorable Mention—Wickwire limestone quarry, Gasport, Niagara county, New York. Operated by the Wickwire Spencer Steel Co. Operated 221 days and worked 91,042 man-hours. Employs 41 men. Had one accident causing two days lost time, making a frequency rate of 10,984 and a severity rate of 0.022.

There has been a big improvement in the quarry accident records of the members of the association since these contests were started, Mr. Adams said.

The session on accident prevention closed with the showing of a motion picture prepared by the Institute of Makers of Explosives, designed to educate users of explosives of the hazards to children and others in the careless handling of blasting caps.

Public Relations

The general subject of the last session of the convention may be termed "public relations." It began with a practical and valuable address by C. D. Franks, Portland Cement Association, Chicago, on "Effective Support of Campaigns for Public Improvements." This paper was a very thoroughgoing analysis by an experienced association official on the psychology of mass action, as confined, of course, to action on bond issues or assessments for public improvements.

Recognizing that indivdiual selfishness is the governing consideration that finally determines the opinions and actions of most of us, the problem is to convince a group of individuals, collectively and individually of the advantages they are to derive from the improvement. Of course the most effective way is advertising and publicity, but a regular campaign organization down to precinct captains is essential to assure success, and word of mouth publicity is still a very important factor in any such campaign.

The most important point to remember is that the one opposed to a proposition is the one most likely to come out and vote. The one favorable or indifferent is not so sure to come to the polls. Mr. Frank went into considerable detail on the relations to newspapers, financing, etc., so that his paper contains a great deal of very practical and helpful data.

The Relation of Purchasing to Industrial Progress

M. E. Towner, general purchasing agent of the Western Maryland Railway Co., spoke Thursday morning on "Purchasing and Its Relation to Industrial Progress." Mr. Towner spoke first of the relations of purchasing agencies to our modern life and then said in part.

"The buyer who subscribes best to modern business progress must recognize certain principles, avoid certain practices and extend that form of business courtesy and interest which established confidence. Let us consider the following:

"ETHICS, which is 'The science of right and right conduct.' Recognition of ethics eliminates sharp practice or the gaining of lower prices through playing one company against another, especially during stress of competition, and by getting such companies who are already low in price, to cut still lower by making mis-statements to them as to prices already submitted. It may be true that several bids are received and none of them considered in line with market conditions. It is fair to reject all and ask for new bids, putting all on a comparable basis. No progressive buyer will do this unless he knows it is fair and consistent with market conditions.

"CONTRACTS. Contractual relations must, on many comodities, be arranged quarterly, semi-annually or annually, thus establishing for the buyer favorable sources of supply, and for the manufacturer knowledge of his customers' requirements, and that he has a market for his output. Such arrangements help the manufacturer in keeping down his costs and his industry running on an economical basis. A contract, in terms of expression, should be clear, as simple as possible and thoroughly understood by both parties. The hardest contract to break is the one which states clearly and equitably the understanding arrived at by both parties.

"SPECIFICATIONS. The value of specifications is in a clear and complete declaration of what the buyer requires or what the manufacturer has to offer and guarantees to furnish. In the main, it is not up to the buyer to tell the manufacturer how to make his goods, but both working together can, through the medium of specification, declare what is to be bought and that it can so be manufactured and furnished.

"SIMPLIFICATION. The United States Department of Commerce, Division of Simplified Practice, has in the last few years, through suggestion and leadership, made it possible for buyer and manufacturer to get together and eliminate many unnecessary sizes, shapes, styles, analyses, formulas and specifications which only complicate business and added to expense. There is much yet to be accomplished. I am thinking of a commodity which, on inquiry as to specification, developed thirteen specifications in the same territory of manufacturing and purchase, and for the same purpose of use.

"PRICES. Considering first that all other considerations, quality, etc., are equal, we can state that those who buy best and to the best interest of all concerned are not always those who accept the lowest price offered. In fact, the low price may not be low enough, or paradoxically, it may be too low. Those who own or manage a property may question seriously a buyer who does not accept the lowest price. He may be able to show them two or three things:

"1st. That with, we will say, ten bids, no price offered is low considering all conditions, or if you please, low after fully analyzing cost and allowing for a fair profit.

"2nd. That seven or eight of the ten show reasonable price uniformity, are found to be in line with general market conditions and related commodity prices, and from the standpoint of quality, reliability and general service rendered, an acceptable price for the commodity. The other two are markedly or inconsistently low, subject to real question as to acceptance.

"3rd. That the real danger to the industry is that their buyer can just as easily, if not thoroughly qualified, accept a low offered price that is too high as he can accept an unjustifiably low price.

"This does not prevent the buyer taking advantage of bargains when legitimately offered. It is true that, through unusual effort or by new process or practice, one manufacturer may be able to legitimately undersell others. This situation can be made clear to a buyer and he will correctly trade with such manufacturer.

"Very often there are those who, with improper knowledge and viewing from the

angle only that certain ones are doing well in a line of business effort, seek to enter the same line, overcrowd the market and also establish, mainly through lack of knowledge of manufacture and cost, prices which are only momentarily of advantage to the buyer, and, in reality, unsound and uneconomic in the long run.

"There are commodities on which prices are all quoted alike or substantially so. Some call this price fixing, and some, stabilizing prices for the benefit of industry. There are times when such action is needful as one of the acts of stabilization. When such prices stand up under the close scrutiny of expert analysis; do not block nor hamper competitive effort; do not bring on manufacturing complacency, or stop one or more manufacturers who are able, through new process or discovery, to manufacture at lower costs and sell advantageously at lower price to do so, then the buyer and consumer can have very little complaint to offer. No expert buyer will, however, pass over without challenge the condition shown, when all or practically all manufacturers of a given line bid alike.

"No buyer for big industry can, by himself, cover every line of product his company is interested in, but through perfection of his organization and records he can come very close to the correct price of prices.

"Many other things could be mentioned and dwelt upon did time permit. In closing I would like to mention that, while great improvement in both buying and selling methods has been made, there is yet much room for improvement in:

"Each using the other's time to advantage, eliminating needless felicitations, getting down to business promptly, solicitnig bids clearly, concisely and completely, in answering those bids without ignoring one or several questions asked, in asking for and conducting only necessary tests, in eliminating the personality method of sale and substituting real ability and knowledge, in the buyer being thoroughly conversant with his company's commodity needs, in eliminating all emolument, and on the part of the buyer, the elimination, to the fullest possible extent, of waiting time for salesmen."

Tennessee Highways

C. N. Bass, commissioner of highways and public works, Tennessee, traced the development of the highways of Tennessee, where remarkable progress has been made in a very few years.

H. E. Rodes, Franklin Limestone Co., Nashville, Tenn., then told some very nice things about Mr. Bass, and the part he had played in Tennessee's state highway development.

Value of the Industry to Transportation

H. O. Hartzell, executive assistant to the vice president, traffic and commercial developments of the Baltimore and Ohio Railroad, spoke on "Crushed Stone Industry; Its Value to Transportation." He said in part:

"The railroads are particularly interested in the handling of crushed stone which represents a very considerable volume of traffic. It is also interesting to note that crushed stone produced for use as railroad ballast aggregated some 10,000,000 tons in 1924, 13,000,000 in 1925 and 16,000,000 tons in 1926, or between 18% and 20% annually of the total production of crushed stone. The value of the crushed stone produced for railroad ballast averaged from $8,800,000 in 1924 to $13,000,000 in 1926.

"So far the Baltimore & Ohio Railroad is concerned, it may interest you gentlemen to know that our purchases of crushed stone for ballast purposes aggregated approximately 450,000 tons in 1923 to 496,000 tons in 1927, representing cost to our company of a little over a half million dollars per annum.

"Shipments of clay, gravel, sand and stone over the Baltimore & Ohio lines agregated about 8,400,000 tons in 1925, 8,750,000 tons in 1926 and 7,000,000 tons for the first nine months of 1927.

"Summing up the figures quoted above indicates, as before stated, reason why the railroads would naturally desire to co-operate to the fullest possible extent with the stone producers in the handling of their production.

"In connection with co-operation the railroads desire to extend to you, I would like to mention one department of our organization, which, I believe, can be of service. We have organized what is known as the commercial development department, under the jurisdiction of the speaker. This department is composed of six bureaus, namely, industrial, geological, industrial, survey, engineering, agricultural and traffic research. We feel it is possible for us to be of assistance to the shipping public, and particularly to those engaged in production of stone, through the medium of practically all of these bureaus.

Our geological bureau can, we believe, be of material assistance to you. We have in charge of this bureau a geological engineer who has had a wide experience through his association with the United States Government, as well as some of the large steel companies. Through his efforts studies have been made of the natural mineral resources on the Baltimore & Ohio system, placing us in position to give authentic information concerning deposits of clay, sand, stone and cement rock and other minerals.

Our enginering bureau, as can readily be understood, may be of considerable service to those engaged in the stone business contemplating opening up operations on our lines, as well as to contractors engaged in road construction through preparations of plans to cover track construction.

Our Agricultural Bureau is particularly interested in the operations of the limestone producers and we believe has been of assistance to them. During the year 1923, in co-operation with the state colleges and producers of limestone, the Baltimore & Ohio operated for educational purposes the first soil improvement special train, since which time a total of seven specials has been operated through various states on our lines.

"Our records show that on the seven soil improvement trains there were tested approximately 14,000 soil samples and a total of 231 carloads of liming material were distributed to the farmers for demonstration purposes.

"That good results have been secured is evidenced by the fact that on the Baltimore & Ohio the carload traffic of limestone from 1922 to 1926 has increased from 289 carloads to 2011 cars, an increase of nearly 600% in five years' time.

"It is our belief that the bureaus mentioned above can be of service to you gentlemen from time to time and it will be our pleasure to have you call upon us.

"At this point it would seem proper to mention the question of railroad service. Since return of the railroads to their owners at conclusion of Federal control, the car situation has very materially improved and during the past few years car shortages have been practically unknown. This has been brought about through co-ordination of the railroads with the car service division of the American Railway Association in part, and in part through heavy investments on the part of the railroads throughout the country and purchases of equipment, cars and locomotives and construction of additional tracks and of larger terminals. In order to continue the purchase of equipment necessitating the expenditure of a large sum each year the railroads must necessarily have good credit so as to be in position to place their securities. This credit can only be secured through satisfactory earnings on the part of the railroads and while 5¾% has been fixed by the commission as a fair return to the railroads, it is interesting to note that as a whole, or by rate groups, the railroads have not been able to earn that amount.

"In the face of these large expenditures for equipment and improvement, also increasing costs of labor and materials, as well as the heavy payments for taxes by the railroads, which during the year 1926 aggregated $389,000,00, an increase of 289% over payments made in 1911, attention must be called to the fact that rate adjustments made during the last six or seven years have all been on a downward scale, which it is feared, if continued, might have a decided effect on the service the railroad would be in a position to offer to the public. Certainly with the railroads' revenues being constantly diminished, in the face of increased costs of operation, as mentioned above, it is going to be difficult for them to meet the situation without an effect on service.

"It is gratifying to note the very splendid co-operation offered during the past few

years by the shipping public to the railroads, which is highly appreciated. It is particularly gratifying to note the recent absence of radical legislation and it is felt if left alone the railroads, who have marked out a course and followed it successfully during the past seven years, having handled in 1926 the largest volume of traffic ever moved in any one year, can continue to give good service as long as that situation continues.

"It has been announced that Senator Brookhart of Iowa is framing a bill for government ownership of railroads, which he claims will have the solid support of the progressives, whoever that term embraces. He made a significant statement in connection with this proposed measure, that it would have powerful support from an unsuspected quarter. Perhaps he referred to bond holders to whom he proposes to give tax-free government bonds in exchange for their railroad bonds. At this they would no doubt be very delighted were it not that the senator indicates he will squeeze the value of the railroads down to 12 or 15 billion dollars. In that squeezing process he could hardly expect the stockholders to suffer all the punishment. When the bondholder learns just what the senator has in mind he would probably demur.

"One other senator has suggested that the railroads be given another chance. A chance to do what? Never was railroad transportation service as dependable and efficient as at present. All that is the matter with the railroads today is that they can handle and need more business."

President of National Sand and Gravel Association a Guest

R. C. Fletcher, recently elected president of the National Sand and Gravel Association, was a guest of the convention on Wednesday. He was cordially and graciously introduced to the convention on Wednesday morning by President Graves. After an exchange of felicitations Mr. Fletcher launched into the main object of his visit, which was to suggest the co-operation of the two national associations in the solution of certain problems common to each. One of these at the present moment is the competition of certain portland cement manufacturers in the aggregate business, under conditions that are very unfair to the commercial aggregate producers. Mr. Fletcher also was a distinguished guest at the speakers' table at the annual banquet and made some brief remarks in connection with the possibilities of the two associations working in harmony. Acting upon Mr. Fletcher's suggestion the convention at Thursday's session voted to ask the president to appoint a committee, to act with a similar committee of the National Sand and Gravel Association, to see what can be done in the matter of unfair cement company competition in the aggregate business.

The Banquet

The annual banquet was as remarkable as all the association's banquets have been for the high character of the speakers present and their addresses. The speakers included Harold F. Van Orman, lieutenant-governor of Indiana; A. J. Brosseau, president of Mack Trucks, Inc., and chairman of the highways committee, National Automobile Chamber of Commerce; Norman Hapgood, the well-known journalist and ex-minister to Denmark, and George E. MacIlwain, economist and analyst.

The feature of the occasion was the presentation of the *Explosives Engineer* safety trophy, which was offered for competition among members of the association. It was presented by N. S. Greensfelder, of the Hercules Powder Co. and editor of the *Explosives Engineer*. The trophy was awarded on the judgment of W. W. Adams of the Bureau of Mines, to the Louisville Cement Co.'s plant at Speed, Ind., which had an exposure of 2934 hours per man without an accident. This record was almost equalled by the Monroe, Mich., limestone quarry of the France Stone Co. of Toledo, Ohio, which received first honorable mention, and which also had a record of no accidents. The Wickwire Spencer Steel Co.'s quarry at Gasport, N. Y. received second honorable mention with a record of only one accident.

Entertainment Features

Beside the annual banquet an entertainment was offered for the other evenings of the convention period. They were exceptionally good, and what made this noteworthy was the distance from the facilities of large cities, which can supply convention entertainment on short notice. The success of the entertainments was due to the convention committee and especially its chairman, R. Brink Tyler, who attended personally to many of the details. On Monday evening the annual smoker, with entertainment contributed by the Indiana producers, was held. The greater part of the entertainment was

Mrs. Grace M. Evans, in charge of entertainment for the ladies

a series of boxing matches pulled off in a regulation "squared circle" that was erected in the convention hall. A "jug band" furnished the music appropriate for the occasion.

Tuesday evening a vaudeville show by performers brought down from Chicago was

R. Brink Tyler

given in the big atrium of the hotel. Several of the performers had names and voices which were familiar as they are employed at radio broadcasting stations. After the show there was an informal dance in the atrium.

The program of entertainment for the ladies was especially good this year and it was in charge of Mrs. Grace M. Evans, who is a stone producer and an active member of the association. It included a tea with bridge and five hundred games at the hotel Monday afternoon, and a reception with entertainment features in the evening. Tuesday there was an automobile trip to the French Lick country club and other places of interest and a theatre party for the vaudeville entertainment in the evening. Wednesday afternoon the ladies were the guests of the Hoosier club and in the evening they attended the annual banquet.

Manufacturers' Division Meeting

The annual business meeting of the Manufacturers' Division was held Wednesday afternoon, Chairman C. B. Andrews presiding. In his address, the chairman spoke of the part the manufacturers' division is taking in contributing its share toward the equipping of a research laboratory. Of the $5000 to be raised, $3000 has already been pledged in cash or equipment by 20 member companies. During the coming year a special effort will be made to increase the membership of the division.

H. M. Davison, chairman of the resolutions committee, presented four amendments to the constitution of the Manufacturers' Division, which were approved by

the meeting. The first provides for the changing of the title of regional vice-chairman to vice-chairman. The second provides that should the office of chairman become vacant during an unexpired term, the vacancy shall be filled by one of the vice-chairmen elected by the vice-chairmen by letter ballot, or at a meeting called by the secretary of the association. The third amendment was that when an officer or a director of the division severs his connection with an associate member company with whom he was connected at the time of his election, he is automatically relieved of his duties as an officer or director. The vacancy for such an unexpired term may be filled at the discretion of the chairman and vice-chairmen by another representative of the member company affected, or by a representative of another member company. The last amendment provides that the retiring chairman of the Manufacturers' Division shall become a member of the board of directors for a period of one year, representing the Manufacturers' Division on the board of directors of the National Crushed Stone Association, together with one other member, elected at the annual meeting.

A resolution was passed extending to Chairman C. B. Andrews and Secretary J. R. Boyd the hearty thanks and appreciation of the Manufacturers' Division for their efforts prior to and during the convention in the arrangement for, and execution of, the present most successful meeting.

The report of the nominating committee was then read and the nominations for chairman, vice-chairmen and members of the board of directors were accepted by a unanimous vote of the meeting. The list of the new officers follows:

New Officers of Manufacturers' Division

C. B. Andrews, chairman, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

J. R. Boyd, secretary, 651 Earle Bldg., Washington, D. C.

Vice-chairmen: H. M. Davison, The Hayward Co., New York City; H. T. Gracely, Marion Steam Shovel Co., Marion, O.; M. S. Lambert, Robins Conveying Belt Co., New York City; B. G. Shotton, Hendrick Mfg. Co., Carbondale, Pa.; L. W. Shugg, General Electric Co., Schenectady, N. Y.

Representing the Manufacturers' Division on the Board of Directors: C. B. Andrews; E. G. Lewis, Bucyrus Shovel Co., Milwaukee, Wis.; M. B. Garber, Thew Shovel Co., Lorain, Ohio.

Board of Directors—In addition to the chairman and vice-chairmen the following were chosen as directors: T. L. Burrell, Burrell Engineering and Construction Co., Chicago, Ill.; Gordon Buchanan, C. G. Buchanan Co., New York, N. Y.; N. P. Farrar, Harnischfeger Corp., Milwaukee, Wis.; Fred A. Gill, Gill Rock Drill Co., Lebanon, Penn.; R. W. Gillespie, The Jeffery Mfg. Co., Columbus, Ohio; N. S. Greensfelder, Hercules Powder Co., Wilmington, Del.; R. Grub, Canadian Explosives, Ltd., Montreal, Quebec; J. M. Johnson, Allis-Chalmers Mfg. Co., Milwaukee, Wis.; Thomas MacLachlan, Vulcan Iron Works, Wilkes-Barre, Penn.; A. E. Reed, W. S. Tyler Co., Cleveland, Ohio; S. R. Russell, E. I. du Pont de Nemours Co., Wilmington, Del.; Ralph C. Sullivan, ROCK PRODUCTS.

Machinery and Equipment Exhibit at the Convention

Allis-Chalmers Mfg. Co., Milwaukee, Wis. Exhibited a working model of their gyratory crusher driven by a roller bearing motor through a Texrope drive. Also photograph panels showing their complete line of crushing plant equipment. Represented by J. S. Bond, H. G. Crawford, A. Goldberg, J. M. Johnson, W. E. Keine.

American Manganese Steel Co., Chicago Heights, Ill. Showed in their booth manganese steel dipper teeth, chain, gears, sheaves and other manganese castings. Represented by W. S. Mullally, A. R. Sittig.

American Tar Products Co., Pittsburgh, Penn. Displayed a large panel map of the U. S. showing the locations of ten "Tarmac" plants for shipment of their product into 34 states. Also photographs showing various kinds of roads that had been treated with Tarmac. Represented by B. T. Bell.

Armstrong Mfg. Co., Waterloo, Iowa. Exhibited a working model of an all steel traction type blast-hole drill using a wire lined drill bit. Also a model bit dresser. Represented by F. J. Schermer and W. J. Walsh.

Atlas Powder Co., Wilmington, Del. A complete display of dynamite, blasting machines, electric blasting caps and blasting accessories. Represented by: R. Caskey, W. C. Davis, J. H. Smith, A. A. Mellin, J. L. Bisch and J. W. Tindall.

Bakstad Crusher & Equip. Co., Chicago, Ill. This company showed a model of their 3-jaw crusher. Also photographic construction views of the crusher and literature. Represented by J. R. Bakstad.

Blaw-Knox Co., Pittsburgh, Penn. Displayed their new ball bearing sheave arrangement for clam shell buckets. Also small models of their "Dreadnaught" bucket, circular batchers and all steel turntables. Represented by R. T. Giles and G. Schirmer.

Browning Crane Co., Cleveland, Ohio. Had on display catalogs and bulletins of their locomotive and gas crawler cranes and buckets. Represented by S. Cary and L. B. Janes.

Bucyrus-Erie Co., South Milwaukee, Wis. Much interest was shown in the unique guessing contest conducted in this booth. A 3-yd. 100-B dipper was filled with stone and everyone was asked to guess the total weight of the stone. This contest was known as "The Low Cost Dipperful." The actual weight of rock in the dipper was 9296½ lb. Maurice Murray of the John T. Dyer Co., Birdsboro, Pa., won the first prize of $50 with a guess of 9316 lb. Mrs. John C. Monaghan, Alexandria Bay, N. Y., won the $25 prize with a guess of 9330 lb. Edwin E. Evans, The Whitehouse Stone Co., Toledo, Ohio, won the $15 prize with a guess of 9350 lb. E. F. Healey, Erie Stone Co., Ft. Wayne, Ind., and Fred J. Stephens, John T. Dyer Quarry Co., Birdsboro, Penn., won the two $5 prizes with guesses of 9350½ lb. and 9355 lb. respectively. This company also had a fine display of their catalogs on Diesel, gas plus air shovels, draglines and cranes. Represented by: E. G. Lewis, F. O. Wyse, M. J. Woodhull, R. W. Conant and P. B. Heisey.

A dipperful of stone which had everybody guessing

Buffalo Wire Works Co., Buffalo, N. Y. Exhibited samples of steel and galvanized wire cloth in all sizes. Represented by W. D. O'Neil.

Burrell Engineering and Construction Co., Chicago, Ill. Displayed electric-flasher views of crushed stone, lime and cement plants designed and built by them. Represented by T. L. Burrell, G. T. Burrell, Jr., M. H. Baldwin, M. E. Crosby, and P. C. Phillips.

Cement, Mill and Quarry, Chicago, Ill. Displayed copies of current issues. Represented by H. E. Hopkins.

Cross Engineering Co., Carbondale, Penn. Exhibited various kinds of perforated metal and buckets manufactured by this company. Represented by W. S. Nicol.

Davis and Averill, Inc., Newark, N. J. Displayed drawings of storage bins built by this company. Represented by J. L. Averill. This booth was shared with the **Asphalto-Concrete Corp.**, represented by T. Claussen and J. J. Devlin and they displayed a section of concrete pipe with a Y.

E. I. du Pont de Nemours & Co., Wilmington, Del. An interesting display of samples of rock, minerals and ore quarried or mined with du Pont explosives and under the sample of the raw material some finished product made from them was displayed. Represented by S. R. Russell, E. T. Wolf, R. H. Summer, A. H. Malsberger, J. C. Ahl, S. M. Nelson, A. J. Shoemaker.

The Dorr Co., New York City. Displayed working models of their Dorrco washer and the Dorr bowl classifier. Represented by H. W. Newton and C. Y. Pfoutz.

Easton Car and Construction Co., Easton, Penn. Showed models of their Won-Way and Phoenix cars and photographs and catalogs on their other types of cars and bodies including quarry bodies for motor trucks. Represented by G. Fraunfelder.

Flexible Steel Lacing Co., Chicago, Ill. Exhibited their complete line of "Alligator" and "High Duty" belt fasteners. Also flexible lamp guards. Represented by G. W. Gramer and J. S. Fitzgerald.

General Electric Co., Schenectady, N. Y. Displayed a totally enclosed fan cooled type ball bearing induction motor. Also their standard back geared induction motor. Represented by E. W. Pilgrim, J. B. Robinson, K. H. Runkle, and L. W. Shugg.

Good Roads Machinery Co., Kennett Square, Penn. A display of catalogs and bulletins featuring their line of crushing and quarry equipment. Especially featuring their new roller bearing 10x30 jaw crusher for reducing stone ½-in. and under. Represented by E. S. Phillips and K. B. Hubbard.

Grasselli Powder Co., Cleveland, Ohio. Exhibited a full line of explosives and blasting accessories. Represented by J. S. Burton, W. W. Phillips, J. MacBlain, M. F. Kincaid, W. O. Dunn.

Harnischfeger Sales Corp., Milwaukee, Wis. This company had an outdoor display of their 1¼-yd. shovel. In their booth they displayed photographs of their shovels in operation. Represented by J. H. Enochs, L. N. Ridenour.

Hayward Company, New York, N. Y. An interesting exhibit of a working model of a clam shell bucket, the operation of which was demonstrated through the use of a working model of a hoist and derrick. Also panels illustrating their clam shell, new dragline and orange peel buckets along with models of the same. Represented by H. M. Davison and H. C. Ryder.

Heisler Locomotive Works, Erie, Penn. Displayed a working model of a 55-ton geared quarry locomotive. Represented by F. L. Swabb.

Hendrick Manufacturing Co., Carbondale, Penn. Displayed perforated rotary and flat screen plates

and "Mitco" grating. Also catalogs and literature. Represented by B. Shotton and D. M. Blackburn.

Hercules Powder Co., Wilmington, Del. Continuous showing of moving pictures on blasting in quarries. Also a new book ready for distribution, "Modern Blasting in Quarries and Open Pits." Represented by W. A. Anderson, W. J. Austin, J. Barab, R. Brodhead, W. F. Gainty, N. S. Greensfelder, J. R. Horlick, Jr., S. R. Johnson, L. Keane, H. C. King.

Ingersoll-Rand Co., New York, N. Y. Exhibited the models N-72, BAR-33 and R-12 Jackhamer drills. Also model X-71 deep hole quarry drill. Represented by J. M. Wells, Wm. Broan, E. C. Geither.

Jeffrey Manufacturing Co., Columbus, Ohio. Displayed a panel board containing chain, buckets and sprockets. Also their anti-friction idlers. Represented by F. A. Behmer and J. R. Warren.

Kennedy-Van Saun Mfg. Co., New York, N. Y. Displayed an electric scene-in-action sign showing their ball bearing crusher direct connected and built in synchronous motor. Also photographs of their gearless crusher. Represented by G. J. Jobson and C. E. Parsons.

Keystone Lubricating Co., Philadelphia, Penn. Showed motion pictures of their pneumatic safety lubrication system. Also samples of parts of this system and grease. Represented by W. T. Allen, V. Berguson and J. H. Yerker.

Koppel Industrial Car & Equipment Co., Koppel, Penn. A complete display of photos illustrating their line of cars and tracks for quarry work. Represented by O. E. Kantenwein and H. W. Redman.

Loomis Machine Co., Tiffin, Ohio. Displayed a statuette of their "Clipper" traction type blast-hole drill. Also photographs of their entire line. Represented by C. C. Hale.

Manganese Steel Forge Co., Philadelphia, Penn. Exhibited all sizes of "Rol-man" double-lock mesh woven manganese steel screens. Also rectangular and square opening screens, chute plates and forged manganese steel pins and bushings. Represented by L. W. Jones, W. H. Potter, and J. S. Morrison.

Marion Steam Shovel Co., Marion, Ohio. Exhibited panels of photographs of all types of shovels, cranes and draglines used in crushed stone industry. Also a photograph of Mrs. Grace M. Evans at the levers of her third Marion A-37 electric shovel. This company conducted a "Lucky Number Button" contest for the producers. Represented by D. L. Cheney, H. L. Cox, J. B. Crew, G. Davis, H. T. Gracely, T. F. Henson, C. M. Howser, R. Ryan, E. R. Wilson.

McGraw-Hill Catalog and Directory Co., New York, N. Y. Displayed copies of recent issue of Keystone metal-quarry catalog. Represented by R. C. Becker and W. B. Kegg.

National Crushed Stone Association, Washington, D. C. A very interesting display of illuminated panels showing various uses of crushed stone in road construction work and for use as railroad ballast. Also a large map of the U. S. showing the location and number of members in each locality. They also had as part of their exhibit a Baroscope for measuring changes in air pressure due to quarry blasting. Also a lifting device invented by M. D. Underhill. Represented by J. R. Boyd and A. T. Goldbeck.

National Malleable and Steel Castings Co., Cleveland, Ohio. Exhibited "Naco" cast steel shovel chain. Also mine car wheels and hitchings of "Naco" cast steel. Literature and reprints from "Rock Products." Represented by L. L. McKee and R. R. Root.

National Safety Council, Chicago, Ill. Displayed several panels of safety posters and bulletins. Represented by W. D. Keefer.

Niagara Concrete Mixer Co., Buffalo, N. Y. Exhibited their triple deck "Niagara" screen and grizzly scalper. Also a working No. 1 screen set up as a complete model installation. Represented by W. L. Wettlaufer, E. L. Wettlaufer, A. E. Ownes and J. L. Westenhaver.

Orville Simpson Co., Cincinnati, Ohio. Exhibited their No. 14 heavy duty Rotex screen. Also a slow motion cross-section of the drive head showing compound system of balancing by means of large and small balance weights. Represented by L. Simpson and A. M. Crain.

The Osgood Company, Marion, Ohio. Displayed panels showing full line of shovels. Also catalogs and general literature. Represented by W. T. Sheehan.

Pit and Quarry, Chicago, Ill. Copies of current issues. Represented by H. W. Munday and C. E. Wood.

Plymouth Locomotive Works, Plymouth, Ohio. Attractive panel display showing their locomotives in crushed stone plants and of their new Diesel locomotives. Represented by E. W. Heath and L. V. Fraley.

Rinek Cordage Co., Easton, Penn. Showed "Rinek" reliable 2-in. well drill rope. Also samples of fibre and 3-strand manila rope. Represented by E. B. Simmons.

Robins Conveying Belt Co., New York, N. Y. Exhibited working models of their Cataract grizzly and Gyrex vibrating screen; also their rubber covered loading point idlers. "An Old Friend" again appeared in the form of a roller bearing equipped Robins troughing idler which has carried 34 million tons of stone without lubrication. This is the fourth year this same idler has been exhibited at this convention. Represented by M. S. Lambert, E. R. Morgan and S. D. Robins.

ROCK PRODUCTS, Chicago, Ill. Displayed the Annual Review and Directory Number for 1927 and the current issue. Also reprints of the Editorial comment on "The Absorption of Freight Rates." Represented by N. C. Rockwood, Edmund Shaw and Ralph C. Sullivan.

Sanderson-Cyclone Drill Co., Orville, Ohio. Exhibited a working model of their standard non-traction electric blast-hole drill. Represented by W. F. Nothacker.

Sauerman Brothers, Inc., Chicago, Ill. Exhibited a model plant for stocking and reclaiming of outside storage with a "Crescent" scraper, steel head post, fairlead block and elevated bridle shifting device. Also moving pictures of their equipment in operation. Represented by G. H. Tompkins and F. A. Pement.

Smith Engineering Works, Milwaukee, Wis. Displayed photographs of Telsmith reduction crusher. Also catalogs and literature. Represented by L. Walker.

Stearns Conveyor Co., Cleveland, Ohio. This company along with its affiliated company, the Chain Belt Co., of Milwaukee, displayed their new Rex-Stearns chilled-face cast iron idler equipped with anti-friction bearings and pressure lubrication. Panels showing samples of chain and buckets, also malleable steel chain for buckets and elevator feeders were shown. Represented by L. B. McKnight and W. B. Marshall.

Stephens-Adamson Mfg. Co., Aurora, Ill. Exhibited a working model live roll grizzly and new equipment for scalping. Also a complete line of belt conveyor carriers, including ball and roller bearing types with high pressure lubrication. Represented by C. H. Adamson, E. P. Escher and E. J. Patton.

Symons Brothers Co., Chicago, Ill. Displayed several photographs of Symons disc and cone crushers. Represented by L. D. Hudson, J. M. Thistlewaite and A. C. Colby.

Taylor-Wharton Iron and Steel Co., High Bridge, N. J. Exhibited a "Tisco" solid manganese steel dipper. Also manganese dipper buckets, dipper teeth, chain and sheaves. Represented by C. B. Andrews and L. E. MacFayden.

The Thew Shovel Co., Lorain, Ohio. A unique electrical flasher display of the "Center Drive" of Thew's shovels and cranes. An interesting contest was conducted as part of this display called "Thew Center Drive Roulette." Attractive prizes were given to the winners. Represented by M. B. Garber, T. S. Freeland and J. B. Loughry.

Traylor Engineering and Mfg. Co., Allentown, Penn. Displayed catalogs on their jaw, gyratory and roll crushers. Represented by B. Haislip and W. C. MacDowell.

Traylor Vibrator Co., Denver, Colo. Exhibited a 42-in. by 70-in. "Screen Supreme" vibrating screen. Represented by Paul Wigton.

Troco Lubricating Co., Philadelphia, Penn. Displayed literature on stone crusher lubricants. Represented by L. Beebe.

The W. S. Tyler Co., Cleveland, Ohio. Exhibited a full size Hum-mer electric vibrating screen. Also samples of wire cloth and screen. Represented by H. P. De Hart, J. W. Piggott and W. D. Pringle.

Union Explosives Co., Clarksburg, W. Va. Displayed dynamite and blasting supplies, also Cordeau-Bickford detonating fuse. Represented by H. H. Conley, H. G. Ashcroft and J. E. Long.

United States Bureau of Mines, Washington, D. C. Exhibited various safety devices, model of a rock-dusted mine, bulletins and pamphlets published by the bureau and photographs showing wire saw working in a slate quarry. The bureau also had one of their first-aid cars at the convention which was open for inspection. Represented by W. W. Adams, A. A. Munsch, R. S. Stegall and J. R. Thoenen.

U. S. Bureau of Public Roads, Washington, D. C. Showed color panels showing work of Federal Aid Road bureau and part of state highway department's work. Represented by G. E. Ladd.

Vulcan Iron Works, Wilkes-Barre, Penn. A good display of photographs and literature of their steam and gas locomotives. Represented by J. F. O'Brien.

Williams Patent Crusher and Pulv. Co., St. Louis, Mo. Exhibited a working model of a Williams non-clog crusher for crushing muddy rock without choking. Also samples of the hammers for their Jumbo crusher. Represented by R. F. Schneider.

Registration

ACTIVE MEMBERS

Adams, C. G., The France Stone Co., Bloomville, Ohio; Adams, W. J., Cushing Stone Co., Schenectady, N. Y.; Albright, R. H., Grove City Limestone Co., Grove City, Penn.; Allen, H. B., General Crushed Stone Co., Philadelphia, Penn.; Andrews, Wm. M., Lake Erie Limestone Co., Youngstown, Ohio; Atwood, E. R., Old Colony Crushed Stone Co., Quincy, Mass.; Avril, Arthur C., The France Stone Co., Toledo, Ohio; Armstrong, W. A., Universal Granite Quarries Co., Chicago.

Babcock, B. R., The Callanan Road Improvement Co., South Bethlehem, N. Y.; Bair, H. E., The France Stone Co., Toledo, Ohio; Bales, M. M., Elmhurst Chicago Stone Co., Elmhurst, Ill.; Balfe, Geo. H., Monon Crushed Stone Co., Monon, Ind.; Bamberger, M. M., Interstate Crushed Stone Co., Springfield, N. J.; Barres, A. G., General Crushed Stone Co., Wilkes-Barre, Penn.; Beam, C. C., Melvin, Ohio; Beerhalter, J. R., Duluth Crushed Stone Co., Duluth, Minn.; Bibb, F. F., Genesee Stone Products Co., Batavia, N. Y.; Black, G. G., The France Stone Co., Toledo, Ohio; Black, W. J., Brownell Improvement Co., Chicago, Ill.; Blair, A. J., Lake Shore Sand and Stone Co., Milwaukee, Wis.; Blakeslee, Harold L., Connecticut Quarries Co., Inc., New Haven, Conn.; Bonnell, L. C., F. R. Upton, Inc., Newark, N. J.; Boyd, J. R., National Crushed Stone Association, Washington, D. C.; Brandon, H. H., The Ohio Marble Co., Piqua. Ohio; Brewer, Chas. D., Duluth Crushed Stone Co., Duluth, Minn.; Brewer, R. D., Connecticut Quarries Co., Mt. Carmel, Conn.; Britt, D. C., Great Notch Corp., Newark, N. J.; Buchholtz, Clarence L. Genesee Stone Proucts Co., Batavia, N. Y.; Bugg, Wm., Consumers Material Corp., Kansas City, Mo.; Bannister, A. H., Brownell Improvement Co., Chicago, Ill.; Baylor, Claude L., Louisville Cement Co., Speed, Ind.; Baylor, Harry D., Louisville Cement Co., Speed, Ind.; Bengston, A. L., A. C. O'Laughlin Co., Chicago, Ill.

Caldwell, A. B., Genesee Stone Products Co., Batavia, N. Y.; Callanan, J. R., Callanan Road Improvement Co., South Bethlehem, N. Y.; Campbell, R. S., Holston Quarry Co., Knoxville, Tenn.; Cartwright, L. R., Mid-West Crushed Stone Co., Indianapolis, Ind.; Casparis, Kenneth E., Wisconsin Granite Co., Redgranite, Wis.; Clark, Claude L., Ohio Crushed Stone Association, Columbus, Ohio; Clark, H. A., Consumers Co., Chicago, Ill.; Clark, Harvey N., Dolomite Co., Rochester, N. Y.; Chamberlain, Col. O. P., Dolese and Shepard Co., Chicago, Ill.; Collett, John, Midwest Crushed Stone Co., Ridgeville, Ind.; Cooke, J. H., The Lynn

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Maintenance of Interior Marble

CLEANING preparations in present-day use have been studied to determine the extent of injury that may be caused by harsh grits and such salts as sodium carbonate, sodium bicarbonate, and trisodium phosphate. These salts are present in many trade cleaning materials and have been shown to have an injurious effect, due to their crystallizing action, which may manifest itself after a considerable period of frequent use. The abrasive action of the usual type of grit was found to be of little consequence when such is used on marble floors, but will prove injurious to polished marble.

The harmful action of neutral salt solutions on marble may present itself in other ways than from their use in cleaning. They may penetrate the slabs in soda-fountain counters where many different salt solutions are splashed against the marble or reach it at the floor line. In the case of damp walls, small amounts of various salts are dissolved from the masonry walls or carried into the marble-work by the ground water. Many different salts were shown to have severe effects when allowed to crystallize within the marble. Those which appear to have the most severe action are sodium chloride, sodium sulphate, magnesium sulphate, sodium carbonate, sodium bicarbonate, ammonium carbonate, and trisodium phosphate.

Means of sealing the backs of marble slabs before use under severe conditions have been studied. The results indicate that wax solutions do not form a perfect seal, and such treatments cannot be relied upon to prevent injury under continual exposures, such as may occur on damp walls. Paraffine applied by a heat treatment seems to be fairly efficient as well as very durable.

Many experiments have been made to develop methods of eliminating various kinds of stains from marble, which resulted in practical means of treating the more usual stains occurring on the marble-work of buildings, such as iron, tobacco, bronze, ink, linseed oil, lubricating oil, pitch, and general service stains.

A new bulletin, from which the above is an abstract, has been brought out as Technologic Paper No. 350, by the Bureau of Standards, Washington, D. C. The cost is 35 cents per copy.

Molding Sands of Kentucky

IN the preparation of "Molding Sands of Kentucky," each of the 19 counties in the state known to contain molding sand was visited by the author, Charles H. Richardson, assistant state geologist, Kentucky Geological Survey. His investigations have led to the conclusion that there are approximately 10,000,000 tons of molding sand in the state, which figure includes decomposing or slightly cohering sandstone which may be used as core sands or in constructional work.

In all, 103 deposits were visited, of which 73 were active and 30 inactive. Samples from 36 of the active deposits were carefully analyzed and the results embodied in the report. A study of this report throws new light on the characteristics of the Kentucky molding sands and affords a means of comparison with those of other states.

Copies of the report are available at $1 each on request to W. R. Jillson, director and state geologist, Kentucky Geological Survey, Frankfort, Ky.

Direct Production Costs of Broken Stone

THE Bureau of Public Roads, U. S. Department of Agriculture, has issued a 70-page booklet (Miscellaneous Circular No. 93, May, 1927) by Dr. George E. Ladd, entitled "Direct Production Costs of Broken Stone." An abstract of this report was published in *Public Roads*, November, 1926, and reprinted in ROCK PRODUCTS, November 13, 1926.

The full report contains many more details in regard to what the costs cover than did the abstract referred to above, and undoubtedly will prove valuable to all commercial crushed-stone producers. This study was made in 1918 and 1919, and as there have been very considerable changes in the industry in the period of time since then, the costs themselves are perhaps of more academic than practical interest.

The value of the report is also very limited, since all such items as capital investment, interest, royalties, general repairs and replacements, insurance, depreciation, depletion, opening quarry face, general supervision, accounts, sales, and delivery costs are omitted. As these items are rather important ones in any study of the cost of producing crushed stone, it can be seen that what remains is little more than powder, power and labor costs.

The forms used in collecting and computing the costs will be found useful, and will probably help many producers to see costs that are commonly overlooked, especially in small operations. However, there are many things that make any comparisons of cost, such as these, very misleading to the uninitiated. For example, they cover only limited periods (7 or 8 weeks) during July and August, which is the height of the producing season.

Any experienced quarry operator knows that the unit costs of producing 8000 to 50,000 tons at this particular season of the year is no criterion for the unit cost of producing a year's output of 50,000 to 500,000 tons spread over 12 months or 10 months of the operating season. Nevertheless, as a description of ways of doing business, the bulletin will doubtless prove worthwhile reading for any quarry operator anxious to improve his operation and lower his costs. The author's conclusions are interesting (and in some instances curious).

Conclusions

"At many plants, especially the smaller ones, only a crude system of bookkeeping is used. As a rule the distinction is not made between bookkeeping and cost keeping. If total costs are too high the owner does not know where the trouble lies. Indeed, within a wide range of costs that lie inside the profit line he is likely not to know whether any or all of his costs are too high or what methods, if any, should be changed, or whether a foreman or superintendent is getting the best possible results from labor. As this is true with direct costs, so it is true with indirect costs, and a very common fault is to take little or no account of such factors as depreciation and depletion.

"The writer studied costs at three quarries located in the suburbs of a large city which were owned and operated by a contractor doing a large business. Most of the broken stone produced at these quarries was used on his contract jobs. Such stone as was sold was sold by the yard and measured in the delivery trucks. All the rest of his product was sent by truck to centrally located scales for weighing. Incredible as it may seem, no record was made as to which of the three quarries the stone came from, and no individual records were kept of their output. The owner only knew the total production of the three quarries, which were several miles apart and under separate managements.

"With reference to face-breaking, there is no question that modern types of hammer drills should be used for bench work at least, and that in the long run the use of air instead of steam is economical in spite of the necessary investment in a compressor. Well drilling and wide spacing of holes and snake holing high faces reduce very largely the total cost of face breaking, and the type of explosive used should be determined by both experience and advice from manufacturers.

"Where the scale of operation is not too large the most satisfactory method of bowlder breaking is steel balling, although this might not be applicable to the breaking of bowlders in some of the tough diabases which are sometimes quarried. This must be determined experimentally. Comparative results in these studies indicate that mud capping is the most expensive method.

"Loading by hand into high receptacles costs from two to three times as much as loading into low scale boxes. Steam shovels may be economically operated in comparatively small quarries and a great deal of sledging expense saved if a reasonably large initial crusher is used.

"The horse-drawn dump cart is most expensive as to both loading and delivery. Delivery by derrick directly and plus tramcar is relatively inexpensive, and the results as shown in costs of delivery at certain quarries do not do justice to the method, because in each case with insignificant increase of expense the number of tons delivered could have been more than doubled, while the results by the dump-cart method were for the maximum capacity of operations, and any increase in capacity called for a proportional increase in expense.

"For distances up to 300 ft. at least, delivery is very economically accomplished, if grade permits it, by hand-pushed or horse-drawn tramcars of 2 to 4 tons capacity. The lowest cost method of delivery among the quarries of this study was by automatic-dumping 6-ton tramcars (steam-shovel loaded) pulled up a gentle grade to crusher by drum hoist and returned to quarry face by gravity. A few posts set in the quarry floor as cable guides made it possible to draw these tramcars around curves and thus made all parts of the face available for this method without unnecessary track complications or extra assistance other than such as could be given as needed by the quarry foreman. Power locomotives are of course necessary for long hauls and large operations, and simple track arrangements cut down delivery expense.

"Crushers above quarry floors and complicated track and switch arrangements result in high cost of delivery to crusher. Pit-type quarries, as would be expected, have relatively high costs for delivery.

"The kind of power used has much to do with costs. The more extensively electricity is used, the more economical are operations.

"At most small-scale quarries the initial crusher is too small. The saving through use of a small crusher is usually lost several times over by increased sledging costs.

"For large-scale operations plants are usually designed, methods adopted, and layouts planned by competent engineers. On the other hand, for small plants these features usually result from expediency, experiment or guesswork. Sometimes they result from previous experiences, good or bad, where very different conditions prevailed. As a rule insufficient attention is paid to the relations between the cost of bowlder breaking and the methods of loading, drilling, blasting, and the size of initial crusher. The method of one operation is dependent for success upon that of the other. In other words, operation methods are interdependent.

"Whenever possible in establishing a broken stone plant the probable duration and both present and probable future magnitude of operations should be first determined. A large plant is, of course, not justified by small ledge holdings, and the relation between these two must be recognized. Topography must be studied and, if possible, a site for the plant procured below the level selected for the quarry floor and as near the face as blasting operations will safely permit. The ledge itself should be studied with reference to joint planes and seams, and the rock itself tested for percentage of wear. Conditions as to the former will indicate drill-hole spacing and blasting methods likely to be most satisfactory, and the latter will give information as to the probable cost of drilling.

"If these considerations, together with the foregoing notes on various operations, are kept in mind, they should lead to production costs lower than those now incurred.

"Finally, it should be stated that no plant can afford to omit keeping costs on each unit of operation."

Loss Prevention and Insurance

Some Little Appreciated Facts About Industrial Hazards and Insurance Coverage

By H. W. Forster
Vice-President, Independence Bureau; Member Brown Crosby & Co., Philadelphia, Penn.

TO THE PROGRESSIVE plant manager, prevention of loss and financial indemnity for losses go hand in hand. This is partly due to the fact that he has learned that a very large proportion of fire and accident risk can be headed off by intelligent, persistent activity on his part, and to the fact that the insurance business as a whole encourages such activity in that it sells him his protection at a lower cost.

How marvelously prevention and insurance have co-operated is perhaps best illustrated by the experience of the cotton mills. In the good old days when these were concentrated in New England the average insurance rate on cotton mills ran in excess of $5 per $100 per year. Today, as the result of superior construction, the general use of sprinklers, the safeguarding of hazards and excellent care of properties, the average cotton mill net fire insurance cost is approximately 5c per $100. Here is the reduction of 100 to 1 in insurance cost, with far greater safety to business and with distinct advantage to all concerned. To the layman it may seem strange, but it is a fact that the average insurance company would rather write a large line at a very low rate than a small line at a very high rate.

Only a few features of a fire prevention and protection program are promptly reflected in insurance rates. These are chiefly those bearing upon type of construction, the provision of adequate water supply for hose streams, installation of sprinklers, provision of extinguishers and pails and watchman service. A very large proportion of the things which are done to minimize the chance of fire outbreak, to keep equipment in first-class shape, and to have men understand what to do in case of emergency are not directly measured by insurance rate reductions, but they do bear greatly on efficiency and upon the safety of the business. This point is emphasized because occasionally the manager refuses to move unless he can see a rate reduction.

***THIS ARTICLE** was written at the most earnest solicitation of the editor by an exceedingly busy man—a man who is universally recognized by the largest industrial organization in this country as an outstanding authority on insurance in all of its numerous branches. It was largely through the author's knowledge and work that the Accident Prevention and Insurance Bureau of the Portland Cement Association was successfully launched.—The Editor.*

Rarely Considered Fire Losses

Bearing upon the importance of prevention of loss, it should be mentioned that even where supposedly adequate property damage fire insurance is carried, some very definite losses normally fall upon the owner. Consider, for example, the following factors:

(a) The interruption to the business with resultant inability to earn fixed charges and a profit.

(b) The fact that since it is not ordinarily the custom to insure depreciation, the value of the depreciation falls on him.

(c) The fact that frequently the new plant is built upon a better and more expensive basis but perhaps does not any more definitely contribute to profits than did the old plant.

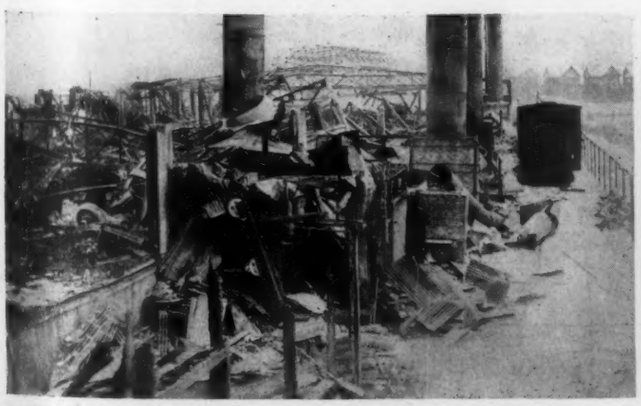
(d) The stress and strain on an organization of a serious fire has a very definite dollars and cents value.

There is no doubt whatsoever that only the business which is unsuccessful ever reaps any financial benefit from a serious fire.

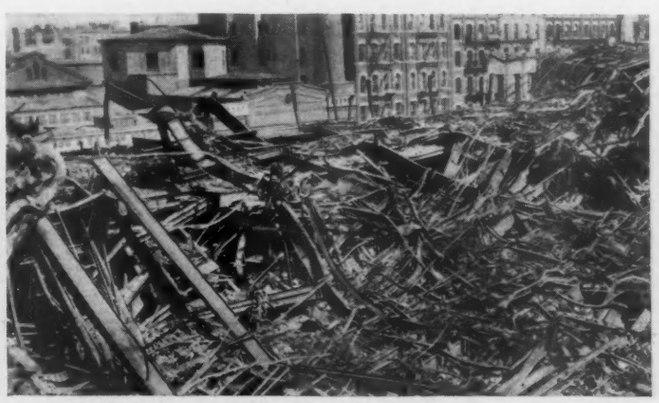
In the industries among which are found the majority of readers of ROCK PRODUCTS, namely, quarries, cement plants, plaster mills, etc., the fire record in the past has been nothing of which to boast. Many plants have been of a highly combustible characted and some are today. Furthermore, a number which have considerable steel in their construction have wooden roof sheathing of floors containing sufficient combustible material to wreck the entire structure. There are very few plants where the problem of fire prevention and fire protection is not an exceedingly important subject as regards at least some of the major buildings in those plants.

Plank and Steel Construction

The idea is current among many intelligent men that the burning of plank on a structure which has a steel frame is not likely



A modern plant with nothing to burn but a plank roof—yet a total loss



Three-story incombustible street railway car house totally destroyed because all the steel work was unprotected

to do any serious fire damage. One cut illustrates what happened to an Eastern plant. The construction was absolutely incombustible except for a plank roof on steel trusses and beams.

In the distance can be seen another unit partially completed which will illustrate the type of construction of the collapsed building.

The other pictures show what happened to a large Eastern street railway car barn, three stories high, which was entirely incombustible in its construction, but where unfortunately the steel beams suporting brick arch floors on the under side were not insulated against heat. The burning of a considerable number of trolley cars wrecked the structure and resulted in a loss of over $2,000,000; and that was some years ago when unit prices were lower than at the present time.

Not long ago in Western Pennsylvania an absolutely modern metal treating plant built of brick, concrete and steel and with a plank roof covered with asbestos shingles was totally destroyed with an uninsured loss of over $600,000 because an oil pipe broke and sprayed burning oil on the roof.

No matter how heavy the steel, the burning of any substantial amount of wood is enought to deflect it and generally to wreck the structure.

Common Causes of Fire

Very few fires may be attributed to "acts of God." Those following lightning, windstorms or earthquake fall in this category, but they are a very small proportion of the total number. Any first-class management, particularly if it has the help of capable insurance engineers, can detect at least 75% of all the possibilities of fire outbreak and can eliminate that percentage without serious expense or any operating inconvenience. Bad housekeeping is one of the most important elecents in fire cause, and good housekeeping bears not only upon fire prevention but also upon safety and upon efficiency.

Heat hazards, particularly stoves and dryers, are a very common cause of fire. Many people have the idea that because a stove or a furnace rests upon brick or concrete, that the wooden floor below is safe. The reverse is true. Plenty of space for circulation of air is far greater protection to wood than a thick layer of incombustible material which holds heat and which may start a fire days after the stove or furnace has last been in use.

Electric wiring is often anything but well installed, particularly in properties where there is heavy vibration, where dust can settle on fixtures and conductors, and where occasionally falling stones may strike them.

The smoke hazard with careless disposition of matches is the most frequent cause of fire taking the country as a whole. A man may throw a match into a waste basket and have it go out 99 times, but the hundredth time may burn down the plant.

The purpose of this article is not primarily to discuss fire prevention in detail but to point out how possible it is to achieve a high degree of fire safety, how desirable it is to do so, and how absolutely necessary it is for American industry to hold down its losses if it expects to secure moderate insurance cost. The insurance companies are simply tax collectors who collect the amount of the losses plus overhead, plus a small hoped-for profit. In recent years underwriting profits have been exceedingly scarce.

Another view of the destroyed car house emphasizing the weakness of unprotected steel work against fire attack

Loss Possibilities

The very first question which comes up in connection with the study of the insurance problem for a given plant is what are the possibilities of loss under the worst possible conditions. Here, as indicated in the section which discussed steel structures wrecked by the burning of wood, it is well for the management to figure far higher than it instinctively would believe to be necessary. Even the experienced insurance engineer is frequently startled by the size of losses which develop in places where he thought the chances of loss were only moderate. If there is any appreciable amount of combustible material in the construction or contents or both, large loss possibilities must be taken into account.

Insurable Values

Having determined that there is sufficient loss possibility in a given structure to warrant the carrying of insurance, the question of insurable value comes up. Insurable value is not what the property costs, or what one can get for it or will give for it, but what it would cost at the time of the loss to put up a structure of like kind and quality with a reasonable allowance for depreciation and for obsolescence, where that factor has crept in. Of course, we are all familiar with the great increase in units construction values, and most people have now brought their insurance up to something resembling modern needs, but they forget that depreciation is seldom insured and that the cost of a better structure falls upon the owner, and hence it is good policy to insure very generously where any real possibility of loss exists.

Just because an insurance policy carries an 80% co-insurance clause is no reason for not running the insurance beyond that point.

Co-Insurance

The chances are that most men responsible for insurance operations on important properties now understand the co-insurance clause, and yet it not infrequently happens that there is some doubt as to some of the features of this phase of the contract. One of the common misapprehensions is that a man can collect only 80% or 90%, as the case may be, of any loss he suffers. This is not true. The co-insurance clause says in substance that if the assured carries not less than the specified amount of insurance to value, he will collect his loss in full, limited only by the face of the policy. If a $100,000 plant with 80% co-insurance is insured for $80,000 any loss up to $80,000 is paid in full. If the loss exceeds $80,000, the owner of course should have anticipated that possibility and carried more insurance.

Co-insurance is fundamentally fair because the underwriters give a lower rate, where a larger amount of insurance is carried than where a man buys his insurance "flat" and hopes that his loss will not run beyond a fraction of the total value.

Fall of Building Clause

One of the limitations of the standard fire insurance policy which many people fail to grasp is the clause covering fall of building. The common wording of this clause is: "If a building or any material part thereof falls, except as the result of fire, all insurance by this policy on such building or its contents shall immediately cease."

This may be a very serious matter. For example, if there should be a building collapse because of structural weakness and a fire should follow, it would not be possible to collect for the fire under the standard policy because the insurance ceased when a portion of the building fell. Simliarly, if a windstorm or an explosion or an earthquake caused a partial building collapse no fire insurance collection could be made for subsequent fire.

This "fall of building" clause was inserted in the standard policies after the San Francisco experience where the fire insurance companies were called upon to pay the

original value of ruins which had been produced by the earthquake.

This restriction as, well as the risk of direct loss from certain perils warrants consideration of other forms of insurance such as windstorm, explosion, riot and civil commotion and earthquake. The average property owner may at once claim that his particular district has not suffered tornadoes or earthquakes, but that is no reason for assuming that these perils do not exist. American insurance annals are full of cases of stables being locked after horses are stolen. For example, in St. Louis after the September, 1927, tornado, every insurance office in the town kept open days, nights and Sundays, for something like three weeks to take care of the business which was offered over the telephone. There have been in recent years a considerable number of earthquakes in the northeastern part of the United States and Canada. None of them was severe enough to wreck a community, but it would not have taken very much more earth movement to have done serious damage.

It should be borne in mind also that where the likelihood of a loss occurring is not large, the insurance rates are correspondingly low. Tornado rates are far lower in New York state than in Oklahoma, and earthquake rates cheaper in Massachusetts than in California. The big question which the owner must answer is whether or not if he had a bad loss by one of these perils, he would be in an embarrassing or unhappy financial position.

Bridging the Gap Clause Explained

Formerly the situation by which a property owner was confronted who carried, for example, both fire and tornado insurance was that the fire insurance policy ceased as soon as the tornado damaged the property appreciably and that the tornado insurance policy would pay the tornado loss but not any subsequent fire loss. Hence the owner who carried both kinds of insurance was not fully protected. More recently the companies have provided a so-called "bridging the gap" clause, which provides on a tornado policy, for example, that if, as a result of a loss which the tornado policy pays, fire insurance goes out of force, the tornado policy picks up the fire loss. The is equitable and exceedingly important. The same thing is done with earthquake policies.

The insurance companies have acted in perfectly good faith in putting certain restrictions into their contracts because their premiums have not contemplated risks beyond those which they actually assumed. The property owner, however, seldom reads a policy, and if he does is not likely to catch all of its fine points, and he must not be surprised if at times he fails to collect what he thinks are legitimate losses, if he has not seen fit to analyze his conditions fully and to protect himself properly.

Use and Occupancy Insurance

The editor has specifically suggested that use and occupancy insurance be discussed in this article. It is a very important subject and one which until recently has been but indifferently understood by many plant executives.

In substance a use and occupancy policy indemnifies the assured for the subsequent or consequential losses which he suffers as a result of a fire or other peril, if he cannot operate his plant. Use and occupancy insurance is important even where one corporation owns a group of plants, providing freight rates are an important part of the selling price. For example, a rock crushing plant has taken a contract to deliver railroad ballast from a strategically located plant. If this burns, the additional freight rate from another plant may more than wipe out the profits.

These indirect losses can be far greater than direct losses, as witness the burning of one important rock crushing plant where the owner collected in round figures $140,000 of property damage and $220,000 for use and occupancy insurance. This was a most interesting case in that the particular rock-crushing plant would have had to be abandoned within a period of about two years because of the expiration of a lease. That, however, did not relieve the insurance company from liability, because the owner was doing a successful business; and it was agreed that it would have taken him approximately seven months to replace his plant, including time allowance for the special and expensive machinery that would have been required. The plant was not rebuilt.

In some cases where a loss takes place in connection with power supply the situation becomes exceedingly acute. The property damage may be very small, but an entire successful operation may cease because of lack of power. The use and occupancy idea can be extended to cover power which is purchased from an outside company. If fire or storm or explosion or other perils interrupt the power supply the purchaser is indemnified, just as if it had been his own power house that failed.

Use and occupancy insurance, of course, applies to all sorts of property damage including also boilers, engines, turbines and electrical machinery. Suppose the boiler house blows up. The ordinary boiler policy takes care of the property damage, but the use and occupancy policy pays for the inability to earn fixed charges and profits.

The use and occupancy question is sufficiently important to warrant every management making a careful analysis of what its annual unavoidable expenses would total and what its normal expected profit for the next twelve months may be. Of course, interest of all kinds, rentals, taxes and similar costs continue whether a property operates or not. A very large portion of the payroll is also of necessity retained because it would be suicidal to let go of the nucleus of a successful organization. The entire payroll may be insured if the owner wants to do so.

The average management will be surprised to see how large its annual use and occupancy need will be, and if it will consider its property from the standpoint of loss through various perils it is very likely to take a sympathetic attitude toward use and occupancy insurance.

Liability to the Public

A very important phase of the operation of industrial plants, particularly when there is any possibility of explosion as in connection with quarrying operations, boilers, etc., is adequate protection for liability for personal injuries and property damage insofar as the public is concerned. The tremendous gas-holder explosion in Pittsburgh in November, 1927, resulted in numerous deaths, hundreds of injuries and enormous damage to property, is illustrative of what may happen when something goes wrong in a property under the very best of management. Not long ago we found on a certain blasting job no less than 30,000 lbs. of dynamite stored in one building where its detonation would have done very serious damage to the property of the public and probably have resulted in loss of life and many injuries.

It is possible to secure liability insurance to take care of just this contingency, and in many cases it is exceedingly worthy of beng considered. Where boiler plants of any size are located in districts which are closely built up, high insurance limits are advisable. The average management buys boiler insurance in low limits for the inspection service, and with his own property chiefly in mind, which, of course, is very advisable, but the limits should be high. The extra cost of high limits is not large.

Insurance Audit

Insurance is so important and so ramified and so difficult to understand in some of its aspects that the average property of any importance is warranted periodically in having a regular audit made of its insurance conditions. Far more defects and errors are ordinarily found in insurance audits than in the customary financial reviews which are made by chartered public accountants. Furthermore, the effect of suffering a bad loss with inadequate insurance or improperly arranged insurance is far more serious than losing some funds because of dishonesty or careless financial management.

National Gypsum Improvements

NATIONAL GYPSUM CO., Buffalo, N. Y., is installing a new Pennsylvania hammer mill crusher of about 300 tons per hour capacity for primary crushing at its National City, Mich., mill and is considering the addition of a fourth Ehrsam calcining kettle.

Lime Burning Practice Based on European and American Observations

Part I.—Varieties of Limestone—Kiln Types Compared

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

ALL THINGS are relative, and one does not know how good he is, or his plant is, until compared with some kind of a standard. But then there are standards and standards. The 100% efficiency, of course, is the ultimate standard, but that means little when judging performance of a lime plant having an efficiency of only 35%. We know that 100%, or anywhere near it, is impossible. The standard to be of value must be approachable. It must be something that at one time or another actually was accomplished or bettered, something that is consistent for long periods.

I think that anyone will agree that the average American lime plant is inefficient in fuel, in labor, in life of lining, in lime quality; and so, in consequence, the cost of production is so high that it is difficult in some fields for lime to compete with other materials. But can this be corrected, can anyone do anything better, is anyone doing anything better? Some American lime plants are good, have fairly high fuel efficiency and high capacity, but such plants are quite scarce and even these have faults that should not be overlooked. I fear none of them would be suitable to serve as standards.

If such a standard is not to be found in America one is forced to look for it in other lands. In any case, it is well to know what one's neighbor is doing; and most industries today are rather well posted as to progress in Germany or England, France or Belgium. The lime industry, however, knows peculiarly little about the experiences of German and English producers, and the same may be said for the Germans and Englishmen. They also know little about our lime industry. Naturally, this is not right. We should learn from each other, and while due to difference of conditions, certain allowances must be made, that, when information is complete, is not difficult.

With the above in view, I visited various European countries where lime kiln construction, lime burning and kiln operation were studied. In the past few years at different times I have heard about the very good results obtained in Europe, results so much better than ours as to be almost unbelievable, during my visit. I found that results in many respects are far better than ours, even though not as good as hearsay.

Average American Results

Before proceeding we should first realize what we have in this country. The most efficient plant I have ever encountered is the plant of Security Lime and Cement Co. at Berkeley, W. Va. This plant then had three kilns that averaged 60 tons of lime each per day for a full monthly period. The coal gasefied in the producers had a heat value of 14,000 B.t.u., and the ratio for several months' period was 4.5 to 1. The amount of heat used per pound of lime was 3110 B.t.u.

Editor's Note

THIS is the first of the series of articles announced in Rock Products, January 7. The author outlines the different kinds of limestone and the various types of kilns. Then follows a discussion of the deficiencies in the average American lime kiln, which will be continued in the next instalment.—The Editors.

The author, V. J. Azbe, on board the S. S. München

Since the theoretical requirement is 1378 B.t.u., the thermal efficiency of the kilns was close to 45%. The kiln linings had a life of over a year.

The poorest plant I have ever encountered—in point of efficiency—burned coal of 12,000 B.t.u. on direct-fired grates, and had a ratio of 2.2 to 1, consequently used 5450 B.t.u. per pound of lime, or had an efficiency of only about 25%. The kilns had an output of only about 10 tons and a life of linings of from two to six months.

Most of the other American lime plant results fall between these two. An exception are the plants employing mixed firing. There may be some having a higher consistent capacity and efficiency than the first mentioned, but we should doubt it until definitely proven. I know that there are kilns that have lower capacities than the second. Some kilns have been found with a capacity of only 6 tons, and in one plant in the South they had a string of 16 kilns each one having an output of 8 tons of lime per day, and these were not small kilns, either.

The typically average American lime kiln has an efficiency of about 30%, and an output around 13 tons. With necessarily high labor costs, due to small output, and fuel costs ranging between $1.25 and $2.00 per ton of lime, a high sales price follows.

Limestone Varieties

Before comparing European with American practice, it is necessary to realize that the stone burned and lime produced in Europe in some cases are quite different from the more common practice in this country. In this country ordinarily high calcium or dolomitic lime is produced exclusively; in Germany and France much mildly hydraulic and strongly hydraulic lime is burned. One may classify the various limes as follows:

(1) High calcium lime, rapidly slaking if not overburned, containing Mg, Si, Al, Fe oxides not to exceed 5%; forms a large amount of putty with great sand carrying capacity; will not set in water, requires a long time to harden in air; high calcium stone will require the greatest amount of heat to burn, about 1378 B.t.u. per lb. of CaO.

(2) Dolomitic lime containing not to exceed 5% of Si, Al, Fe oxides, the balance being calcium and magnesium oxide in the ratio of about 60 calcium and 40 magnesium. These limes slake slower, will also not set in water, and require a long time to harden in the air. Dolomitic limestone requires considerably less heat to calcine than high calcium stone, due to lower heat requirement and lower temperatures necessary for the burning of magnesium carbonate. The exact amount depends upon the amount of magnesium in the stone and upon the kind of combination with the calcium carbonate.

(3) Slightly hydraulic lime contains, in addition to calcium and magnesium, also

silica and alumina to the extent of about 12% to 15%. It slakes slowly, increases in volume only slightly, it sets in water after 20 days and hardens faster and more equally through the mortar joint.

(4) Moderately hydraulic lime having in addition to calcium and magnesium about 15% to 20% silica and aluminum oxide. It has the same properties as slightly hydraulic lime, only they are more strongly defined. It sets faster and harder under water.

(5) Strongly hydraulic lime contains up to 35% of silica and alumina. It slakes very slowly, sets in about three days under water and rapidly turns to stone of high strength.

To burn hydraulic lime less heat is required, due to the lower carbonate content. The exact amount depends upon the amount of magnesium and its combination, and the amount of silica and alumina and iron oxide. Generally speaking, the lower the calcium carbonate content, the lower the heat requirement and the lower the combined calcium and magnesium carbonate, the lower will be the heat requirement.

Calcium oxide mortar hardens by conversion of oxide back to carbonate by absorption of CO_2 gas from the air. Thus it naturally must harden from the outer surface inward. Hydraulic limes on the other hand depend upon no outside agency for their hardening properties, the same as portland cement, and so the hardening takes place faster and equally through the mortar joint.

Hydraulic lime contains silica, alumina and probably but not necessarily iron oxide. These compounds in burning combine with calcium and magnesium to form a solid solution. The ideal proportion is such that after combination there is sufficient lime left over, which by slaking, tends to break up the entire mass.

There can be other stone variations. It may be very soft and crumbly, as the chalk that is burned around London. It may be very dense, or gruelly, and, finally, crystalline. It may be uniform or quite mixed up. It may contain evenly distributed or also localized impurities. Under certain conditions, the efficiency of burning, the capacity to be obtained, is considerably dependent upon these physical properties, but in the main the governing element as to heat required is dependent upon the chemical composition.

Lime Kiln Varieties

There are different kiln types, as various as there are limestone supplies. Some of these kilns have entirely different operating characteristics. Some are more efficient than others, some require so much labor that they can be used only in Europe where labor is comparatively cheap. Then, there are others that are not used in Europe at all because there the fuel is comparatively expensive. Enumerating the various kiln types we get:

(1) Vertical kiln with grates on which coal or wood is burned and the hot gases enter the kiln.

(2) Vertical kilns with gas producers built adjacent to the kiln; ordinarily such kilns have one or two of its own producers, the gas being conveyed only a short distance.

(3) Vertical kilns gas fired with gas generated by a centrally located producer supplying several kilns or with gas purchased from outside sources, such as natural gas.

(4) Vertical kilns in which the rock charge is alternated by a coke or low volatile-matter, coal charge, the solid fuel burning in direct contact with the stone.

(5) Vertical kilns with special firing methods, stokers, powdered fuel, natural gas, etc.

(6) Vertical kilns of sectional type consisting of several units used alternately for preheating, burning, cooling, emptying and charging of stone.

(7) Rotary kilns fired with gas, powdered coal, oil, etc.

(8) Ring kilns, tunnel style, with progressive firing.

(9) Tunnel kilns with stationary firing and progressive stone movement.

The direct-fired kiln is the most common in the United States. It certainly is the least efficient, and that fact apparently was realized in Europe long ago, since direct-fired kilns there are almost non-existent. Fig. 1 shows the gas analysis obtained on conventional type of direct-fired kiln burning bituminous coal. The fluctuations are quite extreme, there is either too much air or too little air, with conditions right only a fraction of the total time between two draws. Usually, there is either a considerable excess of air or a large amount of CO gas present.

Fig. 2 presents firing data from the same test. A unit of coal in this case is a normally sized shovelful. The irregularity of coal feed is extreme. At the first firing after the draw 48 units were fired, while during some other only four or five. The firing rate on equal time basis was from 19 units per 10-minute period down to one unit and less. The fireman as an excuse would, no doubt, have said that he fired as the fire needed it, and probably he did, but he had no control over the volatile matter, of which naturally greater volumes escaped during the heavy than light firings. The air supply varied inversely with the greatest evolution of volatile matter. When most air was needed, due to the limited draft, least found access.

With high calcium limestone and coal of 12,000 B.t.u. it is unusual to find a plant that, with direct-fired kilns, will give a ratio of 3 to 1 over an extended period of time. Usually it is much less than this. If so, it is not to be wondered that Germany does not use such kilns. They could not afford them. Their cost of fuel as purchased is about on the same level with ours, while labor is only from one-fourth to one-third. Lime sells for about half that of ours, so inefficient firing methods would eliminate profits.

Another objection to direct-fired kilns is high labor cost and low capacity. About the highest dependable obtained capacity known to the writer is an average of 18 tons of high calcium lime obtained per day from a kiln having dimensions of 5x10 ft. Such an output according to European standards is decidedly low and labor necessarily high. The quality is also likely to be poor, due to unequal distribution of heat in the kiln.

(To be continued)

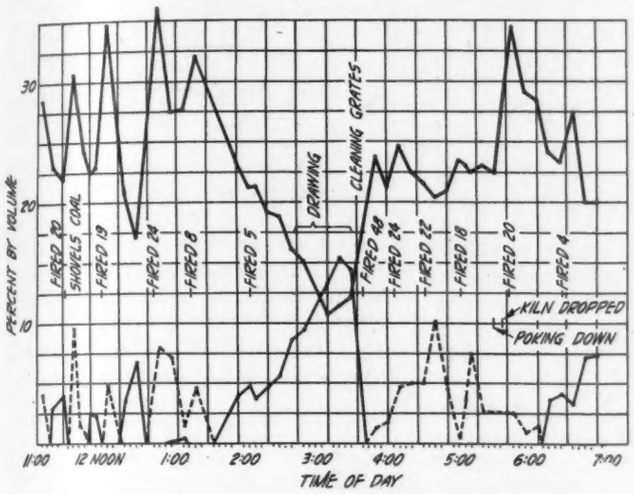


Fig. 1. Gas analysis (8-hr. period) of direct fired kiln

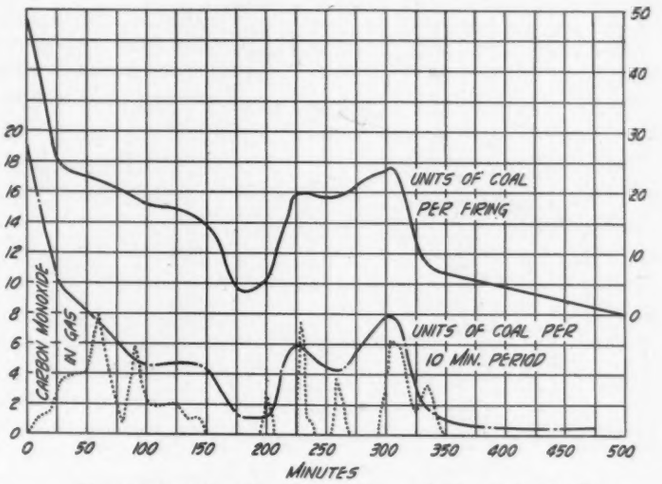


Fig. 2. Coal feeding fluctuations of direct fired kiln

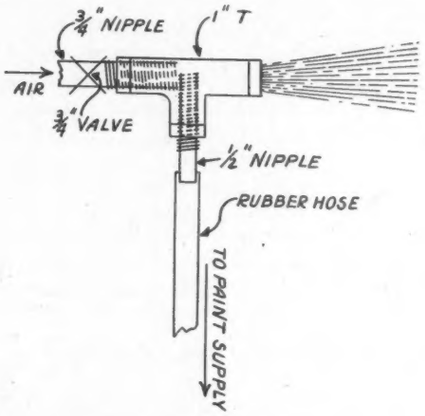
Hints and Helps for Superintendents

A Home-Made Paint Sprayer

By JOHN W. STOCKETT, JR.
Lee Lime Corp., Lee, Mass.

BELOW is a sketch of a paint spraying device which we have successfully used in painting our battery of 10 kilns at Lee. This was devised and built in the company's shop.

A 1-in. T is fitted with a ½-in. and ¾-in. nipple. The nipples are threaded back far enough to permit their insertion to the position as shown. The ¾-in. nipple should be screwed up to the ½-in. nipple so that the ½-in. nipple cuts off approximately half the opening of the ¾-in. nipple. An air hose delivering 80 lb. of air is fitted to the ¾-in. nipple. A rubber hose fitted to the ½-in. nipple leads to the paint reservoir. The paint reservoir can either be a gallon can carried along with the operator or a 50-gal. barrel placed on top of the kiln. The sprayer then siphons the paint from the reservoir, and a valve placed in the paint line convenient to the operator is used to regulate the supply. When operating properly the paint sprays out of the 1-in. opening of the T for a distance of 5 or 6 ft. The paint in this instance was a lime whitewash, but there is every reason to believe that the sprayer would work successfully with a heavier paint such as an oil paint.



Home-made paint sprayer

Drill Records Speed Up Production by Eliminating Delays

MANY quarry operators have reduced the non-productive time and greatly increased the progress of drilling by keeping accurate records, which tell them where unnecessary delays occur and how they can be eliminated.

A time study of the operation of a drilling machine, which will show a record of the "actual drilling time" and also a record of each and every minute of lost time, can be used to work out or establish a system of operation which will greatly increase production, and it was with this object in mind that the Armstrong Manufacturing Co. developed a standard drill report blank.

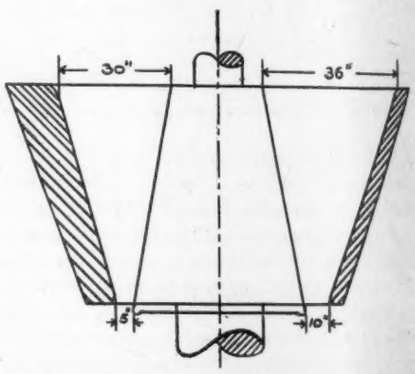
These reports are recorded by the driller and turned in to the office at the end of each day. After 30 days' operation a summary can be made of the daily reports, showing the total amount of "actual drilling time" and the total amount of lost time, which is charged under the various headings of delay. This summary will give a very clear picture of "actual operating conditions," and with this information at hand the superintendent can make whatever changes are necessary to reduce the items of delay and convert this time to the "actual drilling operations."

A sample pad of 100 drill report blanks in duplicate will be furnished by the Armstrong Manufacturing Co. without charge.—*The Armstrong Driller.*

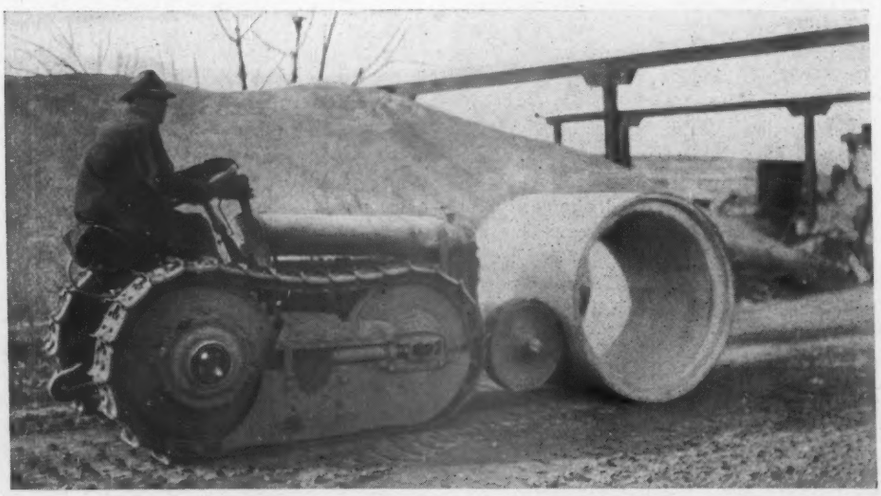
Making Smaller Stone with a Primary Crusher

THE PRIMARY gyratory crusher in a midwestern stone plant, designed to discharge 10-in. stone, was found to flood the secondary crusher. The situation was remedied in a simple manner, easily applicable to other installations where smaller sized stone is desired in the initial crushing.

First, the desired size of the product on discharge was determined and then the feed opening decreased accordingly by maintaining the standard inclination of the concaves. This is illustrated in the accompanying sketch, which shows the feed opening and discharge opening before and after the alteration. Any size product can be made, but the inclination standard to the machine must be maintained on the concaves, otherwise the stone would roll and pocket the bottom of the concaves.



Reducing the size of stone made in a gyratory crusher



Tractor rolls large size pipe about the storage yard

Moving Concrete Pipe with a Tractor

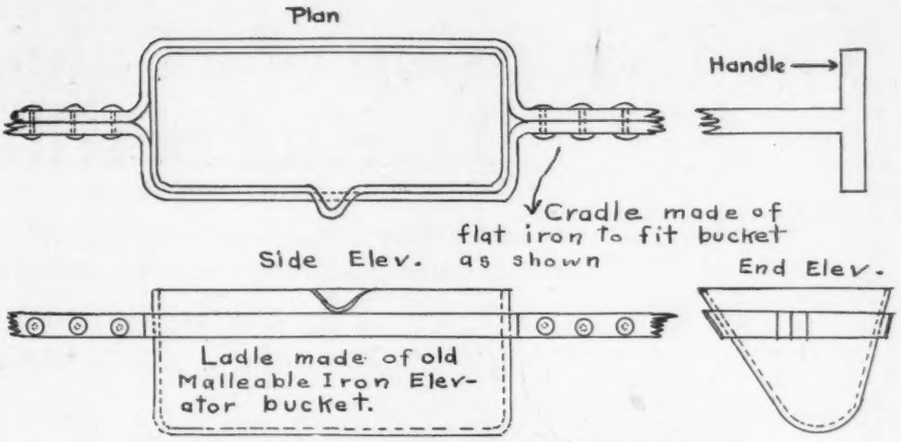
MOVING the larger sizes of concrete pipe about storage yards has frequently been a problem at pipe plants, but the accompanying illustration shows how the problem was solved by one pipe manufacturer. A small tractor was fitted with crawler treads and on the front of the machine a flexible roller approximately 15 in. in diameter was installed. Any large size pipe can be rolled by the tractor with ease and speed,

and the method is much more economical than any other system. This outfit was devised by the Illinois-Wisconsin Concrete Pipe and Tile Co., Beloit, Wis., and has been used with considerable success.

Handy Kettle for Melting Babbitt Bearing Metal

By W. L. HOME
Consulting Engineer, Pine Plains, N. Y.

IN an emergency it was necessary to babbitt a large bearing. It so happened that there was no ladle on the job sufficiently large to attempt the work. However, there was a large malleable iron elevator bucket available and this was used as shown in the sketch. It proved to be most efficient in every way. One might say in objection that the malleable iron will not last very long. However, the ladle is light, is easy to tilt, heats readily on a forge and when burned out a new one can be put in the cradle in a few minutes. The cradle and handle should be made to suit conditions.



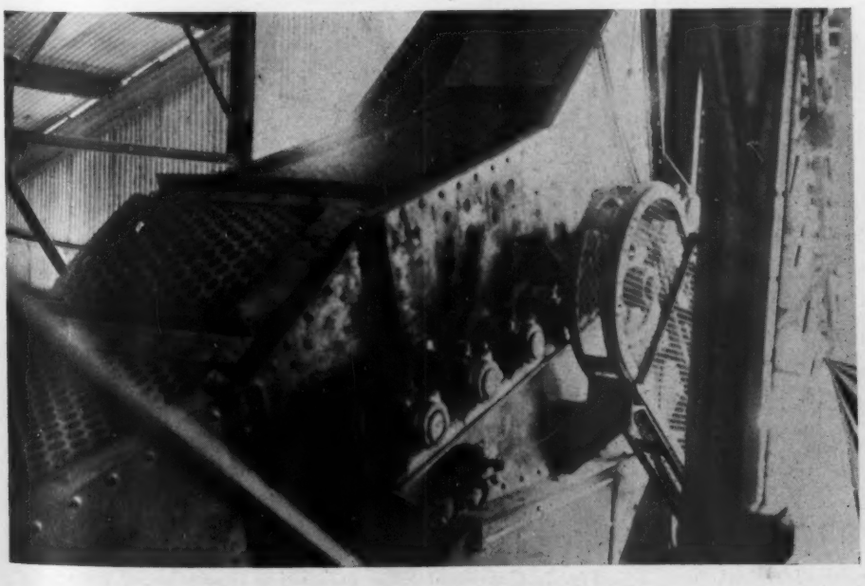
Construction details of kettle for melting bearing metal

Screen Protection for Grizzly

IN most places there is no need to put a cover or any other protection over a grizzly of the roll type, as the action of the grizzly does not throw out stones. But where one grizzly of this type follows another a covering may be useful. The stone in falling from the first grizzly to the second may bounce, and, combined with the motion of the roll, this bounce may throw it out.

The cut shows two grizzlies of the roll type in series. The short chute that connects the two and the second grizzly are covered with old screens to give the needed protection. The screens are in frames of light channel iron that can be lifted easily.

A good reason for protecting grizzlies of this type which have small openings would be that small tools or such things as pipe fittings would not be drawn in between the rolls or lost in the undersize.



Old screens as a protection for the grizzly

Compressed Air for the Quarry

WHERE a quarry is operated by steam shovels and well drills, compressed air is not always available, especially if there is not enough secondary shooting to warrant block-hole work. However, compressed air in a quarry is a mighty fine asset and should always be available. Perhaps you need it for a repair job on a car, track or shovel itself. Perhaps you need it down in the quarry to take up some bad bottom or to take out a bad stretch of toe. Pipe lines in a quarry are hard to keep up and unless a lot of air is needed this method will take care of things nicely. There is a compressor on the side of almost any old locomotive that is large enough to run pneumatic tools, a jackhammer, or furnish air for a forge or do almost anything that a little bit of air can do to save hours and hours of hand labor in time of real need.

By watching your opportunity and getting acquainted with the right fellow, one of these compressors can be obtained from a railroad company for a song. Mount this on your steam shovel, connect it with the boiler, provide a small air tank and air connections, and you may depend that when the shovel needs compressed air in the vicinity of where the real work is going on that the pipe lines are all in and that all you have to do is to turn on the steam, put on the air hose, and everything is ready.

Man Elevators

SOMETIMES the very simplicity of construction of a piece of equipment is of considerable disadvantage for its particular use. In amplification of this statement, the best example is afforded by the recent description of a simple man elevator, published in the Hints and Helps pages of ROCK PRODUCTS, December 10, 1927. Its practicability is not denied, but as one good reader points out, elevators of this design may not pass the legal requirements of the state. His experience in this matter is worth quoting:

"A large storage tank had been designed by a consulting engineer and was being installed and the installation called for a man-lift elevator of the same general principle as indicated in the article mentioned. Unfortunately we did not know there was any legal difficulties about making such an installation nor was it called to our attention until the elevator was purchased, delivered to us and was in process of installation. Fortunately just at that time a state inspector happened along who called our attention to a state law passed several years before prohibiting the installation of such elevators because of their danger to employes. There was nothing else left for us to do except to take down the installation as far as it had been made and attempt to dispose of the machine. Fortunately for us we were able to return the elevator to the manufacturer at a fairly good portion of its original cost. However, we were out several hundred dollars by the time the matter was entirely cleaned up."

The Expansion of a Calcined Gypsum During Setting*

Results Indicate That Expansion May Be Controlled Within Certain Limits by Proper Control of Conditions

By J. A. Murray
Bureau of Standards, Department of Commerce, Washington, D. C.

THE volumetric changes which take place during the setting of calcined gypsum are well known in a qualitative manner, but comparatively little quantitative data on this phenomenon are available.

One of the most common uses of calcined gypsum (plaster of paris) is in the casting of ornamental objects and models. For these purposes a slight expansion of the plaster as it sets is very desirable, as it forces the material into the crevices of the mold, forming a sharp reproduction. Calcined gypsum forms one of the main ingredients of investment compounds for dental work. A slight expansion may be desirable for these investment compounds, but a large expansion is to be avoided.

The difficulty of producing a sanded-gypsum wall plaster which will adhere satisfactorily to concrete is well known. In a few instances, such plaster applied directly to concrete has remained in place for a long time, but in some cases a failure of the bond has resulted. The lack of adhesion may be attributable to the loosening of the bond between the plaster and the wall, due to expansion as the plaster sets. The establishment of the truth or falsity of this is beyond the scope of the present work, but if this is to be done in the future, a method for the control of the expansion on setting will be necessary.

An investigation was undertaken, therefore, with two objects in view First, to determine the magnitude of the expansion in gypsum plasters on setting; second, to determine whether these changes may be controlled by simple methods.

Theoretically, the volume of the set gypsum, calculated from its specific gravity and formula weight, is less than the sum of the volumes of the ingredients from which it is made. Based on this calculation a contraction of the plaster would be expected during setting. An apparent expansion occurs, however, in many cases. This expansion has been shown to be only apparent by dilatometric measurements which have been made by various workers.[1]

T. L. Buckingham[2] made a few measurements of the expansion of dental plasters and found a maximum expansion of 0.29%, which was sufficiently large to impair the value of the plaster for use in dental work. He noted that in many cases a contraction preceded the expansion; a point overlooked by other workers, several of whom used apparatus which was incapable of measuring a contraction. This may explain some of the inconsistent results reported in various papers. R. L. Coleman[3] has recently made accurate measurements of the expansion of dental investments on setting. Because of the large amounts of finely divided silica in these investments, Coleman's results are not, in general, applicable to other uses of calcined gypsum.

The most recent work on the expansion of calcined gypsum on setting is that by J. M. Porter.[4] The investigation reported in the present paper continues that begun by Porter and has been conducted under his direction.

Apparatus and Experimental Methods

Preliminary work indicated that any instrument for measuring the expansion of calcined gypsum during setting should meet the following requirements:

1. It should be capable of accurately measuring both expansion and contraction.
2. Each measurement should be completed within a few seconds.
3. Intervals between measurements should be short.

*Publication approved by the Director of the National Bureau of Standards of the U. S. Department of Commerce.

[1]H. Le Chatelier, Comptes Rendus, Vol. 129, p. 1232-4, 1899. J. H. van't Hoff. Zeit. Phys. Chem., 45, 257, 1903.
[2]Dental Cosmos, Vol. 1, p. 117-119, 1859-60.
[3]Volumetric Changes of Gypsum. Proc. A. S. T. M., Vol. 23, Part I, 1923.
[4]Dental Cosmos, August, 1926.

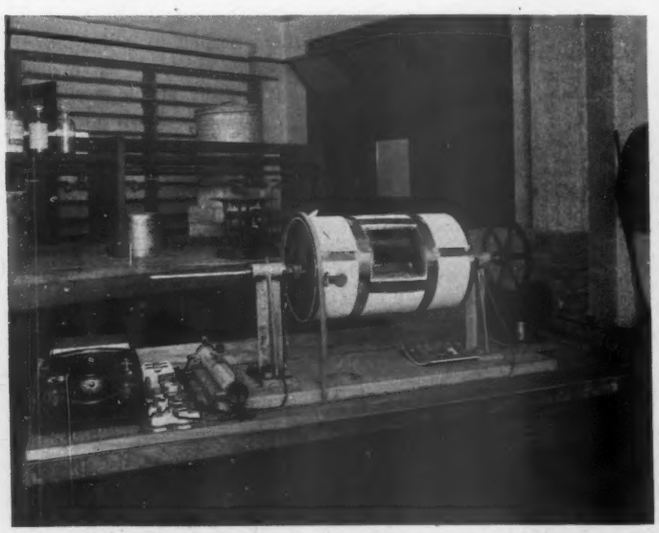


Fig. 6. Specially constructed rotary type electrical gypsum calciner

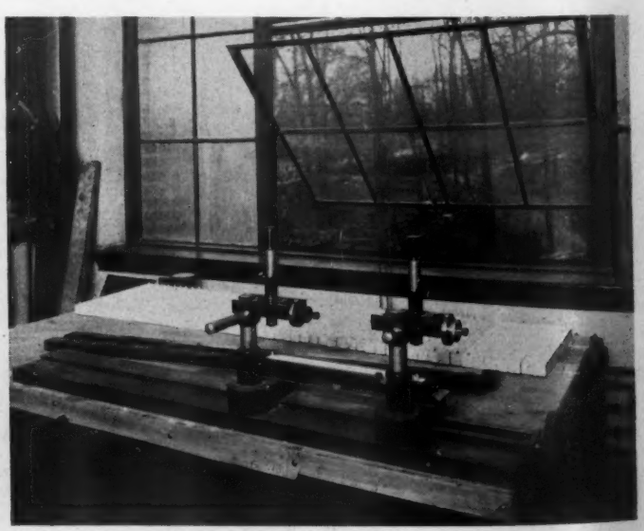


Fig. 1. Comparator for measuring expansion of gypsum during setting

4. Restraint on specimen should be a minimum.

The comparator shown in Fig. 1 was chosen as the instrument most nearly satisfying these requirements. It consists of two microscopes fitted with cross hairs and mounted on vernier slides which are attached to a heavy base. The verniers are graduated so that one division corresponds to a motion of the microscopes of 0.005 mm.

The specimen to be measured was cast in a thoroughly oiled brass mold 13x1x1 in., which rested on an oiled glass plate. Before casting, metal plates 1 in. sq. and ⅛ in. thick were placed at each end so that the paste would not come in contact with the mold. Previous experiments[5] have shown that a glass tube, containing a fine oval capillary with a white background, such as is used for thermometers, provides a good focusing point. The white background when properly oriented to the light source causes the capillary to appear as a white oval against a dark background, furnishing a very clear point from which measurements may be made. Immediately after pouring two pieces of capillary tubing were inserted in the paste about 30 cm. apart. The specimen

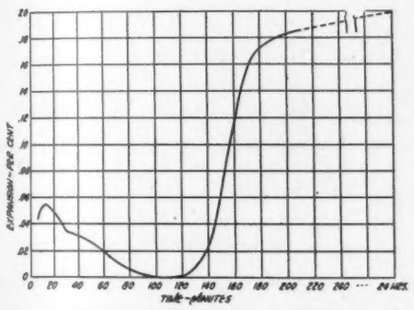


Fig. 2. Expansion of a neat unretarded calcined gypsum mixed with 47.5% water

was then placed on the comparator so that one miscroscope could be focused on each capillary. The end plates were removed and the catch on the mold loosened so that there was no restriction to the motion in the direction of the specimen's length and the only restriction to motion across the specimen was the weight of the mold, which moved, however, comparatively freely on the oiled glass plate.

Before the specimen was set in place the microscopes were set 30 cm. apart by focusing on a graduated bar of invar. The specimen was then inserted as described above and the cross hairs of the microscopes were brought to tangency with the edge of the image of the capillary. The length of the specimen between the capillaries could then be calculated from the readings of the verniers.

A 200 lb. sample of commercially calcined gypsum (plaster of paris) obtained in the open market was used throughout the investigation. In all cases at least three specimens of each mix were measured and in some cases as many as nine. The average of the results obtained with each mix is reported as the expansion. The precision of the results varied considerably, as is noted below. The probable error was calculated for those cases where a sufficient number of

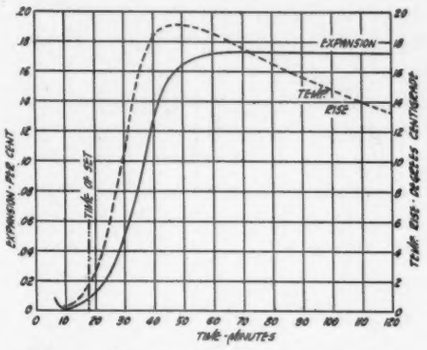


Fig. 3. Expansion of neat calcined gypsum, retarded to set in two hours

specimens had been measured to make the calculation desirable. It was found to average ± 0.017%.

A typical set of measurements is shown graphically in Fig. 2, where the expansion is plotted against the elapsed time from the moment when the calcined gypsum was added to the mixing water. The solid line represents the average increase in length of three specimens of neat unretarded calcined gypsum when mixed with 47.5% water. The broken line represents the temperature rise of the same material as measured by a thermometer inserted in the mix. The time of set[6] of this mix as measured by the Vicat needle was 18 min.

There are several important points to be noted in connection with these measurements. The initial measurement was made six minutes after adding the plaster to the water. During the next few minutes a contraction occurred and the material reached a minimum volume shortly before the time of set as measured by the Vicat needle.

After the minimum was reached, expansion began and continued for about an hour in the case of the unretarded materials. This is followed by a contraction (not shown in the figure) as the material cools, during which the length decreases slightly until the specimen reaches room temperature.

The expansion was not entirely complete at the end of two hours. A very slight further expansion (about 0.005%) was found when the measurements were continued for several days, but this was so small that the additional time required did not warrant continuing the measurements after the readings had remained constant for a period of one hour.

The parallelism between the expansion and the temperature curves would seem to indicate that expansion measurements present a method of following the progress of the set which may be of value when temperature methods are not convenient. This is particularly true in the case of retarded materials where the heat evolution is slow and difficult to measure accurately. In addition, the point at which actual setting or crystallization begins is apparently well marked by the minimum length obtained immediately preceding the large expansion.

The minimum length was used as the base from which all changes were calculated. This length was chosen in preference to the initial length because of its physical significance and the accuracy with which it may be determined. In the following sections the maximum change occurring between the minimum and maximum lengths is expressed as the total expansion on setting. In a few cases reference will be made to the net expansion, that is, the difference between the initial and final lengths.

Factors Influencing Expansion—
A. Amount of Mixing Water

Measurements were made of the expansion on setting of a sample of calcined gypsum the standard testing consistency of which was 48% as measured with the Southard viscosimeter. The amount of mixing water (expressed as per cent of water to weight of dry material) was varied from 37.5% to 55.0% by 2.5% intervals. At first three specimens of each mix were used. The mixes containing 45% or more water gave very consistent results, but the drier mixes were erratic. For example, the expansions on setting of three specimens containing 52.5% water were 0.126%, 0.116% and 0.126%, while three containing 42.5% water expanded 0.200%, 0.193% and 0.146%. Because of these variations it was considered advisable to increase the number of specimens measured, particularly those with the lesser amounts of water. While some irregularity was found in the drier mixes, the results, as given in Table I, indicate a decrease in expansion with increase in the amount of mixing water.

TABLE I—EXPANSION OF A NEAT UNREARDED GYPSUM MIXED WITH VARIOUS AMOUNTS OF WATER

Amount of Water	Expansion
37.5%	0.21%
40.0	0.18
42.5	0.19
45.0	0.20
47.5	0.17
50.0	0.15
52.5	0.12
55.0	0.10

B. Retardation

In studying the effect of retardation on the expansion during setting, it was realized that the retarded mixes would be affected more by evaporation than would the unretarded mixes. Consequently the mold containing the specimen of retarded material to be measured was placed in a metal tray fitted with a plate glass cover. The tray was placed under the microscopes and measurements made as before except that the glass cover was removed for each measurement. The bottom of the tray was covered with

[5] J. C. Pearson, Shrinkage of Portland Cement Mortars and Its Importance in Stucco Construction. Proc. Am. Concrete Inst., 1921.

[6] Methods of Testing Gypsum. A. S. T. M. Standards, 1924.

water so that the setting of the calcined gypsum occurred in an atmosphere of moist air.

A typical curve representing the expansion of a neat material, retarded to set in two hours, is shown in Fig. 3. With reference to the curve it will be noted that for the first 10 minutes there was a small expansion, probably due to slump or movement of the tubes. A contraction, the magnitude of which was several times larger than that of the unretarded material, then followed. When the contraction ceased the length remained constant for a period of several minutes, after which an expansion occurred which was approximately equal to that of the unretarded material. A slight decrease in the case of the more retarded products is probably due to some evaporation, as the cover of the tray was not entirely air tight.

When the difference between the initial and final lengths or the net expansion was considered, it was found that this decreased rapidly with the increase in retardation. This is shown in Fig. 4 and Table II.

TABLE II—EFFECT OF RETARDATION ON THE EXPANSION OF CALCINED GYPSUM ON SETTING

Time of Set	Total Expansion	Net Expansion
18 min.	0.20%	0.20%
120 min.	0.20	0.15
200 min.	0.19	0.14
285 min.	0.18	0.11

C. Humidity

Some specimens of a calcined gypsum, retarded to set in 200 min., were measured

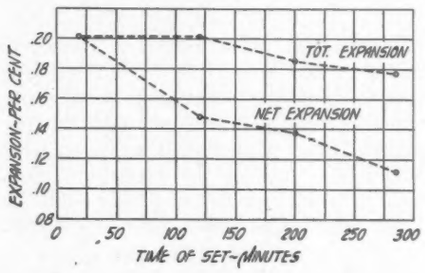


Fig. 4. Expansion of neat retarded calcined gypsum on setting

for expansion on setting, first allowing evaporation to occur, and second, preventing the evaporation as described above. The room temperature was 23 deg. C. and the relative humidity was 20% as determined by a sling psychrometer. Under these conditions evaporation was comparatively rapid. When evaporation occurred, a much greater initial contraction was obtained than when evaporation was prevented, but the final expansions were of approximately the same magnitude.

TABLE III—EXPANSION OF A NEAT CALCINED GYPSUM RETARDED TO SET IN 200 MINUTES

Condition	Initial Contraction	Final Expansion	Net Expansion
Evaporation:			
Allowed	0.13%	0.17%	0.04%
Prevented	0.06	0.19	0.13

D. Amount of Sand

The addition of sand or other aggregate to gypsum plaster affects the expansion of setting of the resulting plaster to a marked extent. An ordinary gaging plaster was mixed with standard 20-30 mesh Ottawa silica sand in the proportions 1:1, 1:2, 1:3, 1:4, and 1:5. The mixes were gaged with water to a consistency which gave a ½-in. slump in a 2x4-in. cylinder. The expansions on setting of these mixes are shown in Table IV and Fig. 5.

TABLE IV—EXPANSION OF SANDED GYPSUM MIXES

Proportion Plaster:Sand	Water Grams per 100 grams Dry Materials	Final Expansion
Neat	42.5	0.20%
1:1	23.0	0.18
1:2	18.0	0.16
1:3	17.0	0.14
1:4	14.5	0.14
1:5	15.5	0.13

E. Grading of Sand

A sample of Potomac River plastering sand was carefully graded into two sizes; the first passing a No. 10 sieve and retained on a No. 14 sieve, the second passing a No. 28 sieve and retained on a No. 50 sieve. These were then mixed with a plaster in the proportion 3 parts of sand of one of the sizes to 1 part calcined gypsum. Water was then added to give a consistency which resulted in a ½-in. slump in a 2x4-in. cylinder, and the expansion on setting was measured. The specimens containing the coarse sand expanded 0.13%, while those containing the fine sand expanded 0.26%.

Since the mix containing the coarser sand required 17% water to bring it to standard consistency, while that containing the finer sand required 20% water to bring it to the same consistency, it would be expected from the results of Part A that the latter would expand slightly less than the former. The results show, however, that the size of the aggregate is a more important factor in controlling the expansion on setting than the amount of water used.

Specimens containing sand which passed a No. 50 sieve indicated a larger expansion,

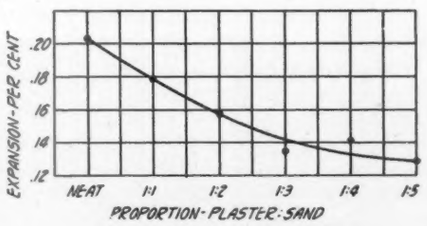


Fig. 5. Expansion of sanded gypsum mixes—Commercial calcined gypsum with standard Ottawa sand

but because of the rapid setting the minimum length could not be determined and the results were not reliable. It was not deemed advisable to retard these mixes, as this would introduce additional possibility of error.

F. Grading of Plaster

A sample of calcined gypsum was graded into four sizes which were mixed with 47.5% water. The sizes with the expansion of each on setting are shown in Table V.

TABLE V—EXPANSION ON SETTING OF GRADED CALCINED GYPSUM

Grading—Through Sieve No.	Grading—Retained on Sieve No.	Expansion
....	50	0.16%
50	100	0.26
100	200	0.26
200	.....	0.39

G. Method of Calcination

In the industry it has been thought that the rate and method of calcination of the gypsum has an influence on the expansion on setting of the calcined material. It was therefore considered advisable to include in this work some measurements of the expansion of gypsum calcined in various ways. The experimental calciner shown in Fig. 6 was constructed for this purpose. It is of a rotary type, electrically heated, and has a capacity of 12 kg. of raw gypsum. Four heating elements within the drum are arranged so that they may be connected in parallel or in series parallel, while for further control an exterior resistance is provided. With this apparatus the time of calcination may be varied from one hour to any desired time, or the charge may be held

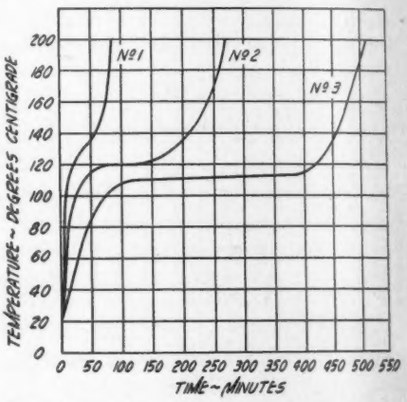


Fig. 7. Time-temperature curves for calcinations of samples Nos. 1, 2 and 3

at a specific temperature for any definite period.

A sample of ground Nova Scotia gypsum was obtained through the courtesy of the Newark Plaster Co., Newark, N. J. The composition of the rock was as follows:[1]

CHEMICAL ANALYSIS

Gypsum ($CaSO_4 \cdot 2H_2O$)	85.0%
Anhydrite ($CaSO_4$)	12.1
Calcium carbonate ($CaCO_3$)	1.1
Magnesium carbonate ($MgCO_3$)	0.8
Silica (SiO_2)	0.4
Iron and alumina (R_2O_3)	0.1

FINENESS

a. Retained on No. 50 sieve	4.2%
b. Passing No. 50 sieve, retained on No. 100 sieve	8.9
c. Passing No. 100 sieve, retained on No. 200 sieve	15.8
d. Passing No. 200 sieve	71.1

Three 6-kg. samples were first selected and calcined for 1½, 4½, and 8½ hours, respectively. In each case the calcination was brought to the beginning of the "second settle" and then stopped. The degree of calcination was determined to be approximately

[1]Standard Methods of Testing Gypsum and Gypsum Products, A. S. T. M. Standards, 1924.

the same in all cases. The rate of calcination of these three batches is shown graphically in Fig. 7.

The calcined material was cooled overnight and the expansion on setting was determined on the following day, using mixes of standard testing consistency. Some of the excess material which was not used for these measurements was stored in air-tight glass jars for later examination. The expansions found were as follows:

EXPANSION TEST ON CALCINED MATERIAL

Calcination No.	Duration of Calcination	Expansion
1	1.5 hours	0.12%
2	4.5 hours	0.16
3	8.5 hours	0.18

There was obviously a considerable difference in expansion when the material was calcined for various periods. As the expansion is greater in the case of the materials calcined for the longer periods, it seemed possible that this might be due to increased fineness caused by longer tumbling in the calciner. Since the material was already very fine, it was impossible to determine any change in fineness with accuracy. Consequently a portion of the material which had been calcined in 1½ hours was replaced in the calciner and tumbled for 12 hours without heating. If increased fineness was the cause of the difference in expansion as originally measured, Sample No. 1 should have shown an expansion after 12 hours' tumbling at least as large as that of No. 3. The average of three determinations of the expansion on setting of material from calcination No. 1 after tumbling 12 hours was 0.124% as compared with 0.121% obtained with the same material immediately after calcination. This indicates that the differences found in the expansion on setting were not caused by the longer period of tumbling.

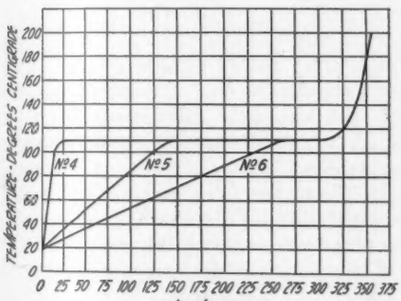


Fig. 8. Time-temperature curves for calcination of samples Nos. 4, 5 and 6

A comparison of the calcination curves of the first three batches shows that the treatment after the "first settle" was approximately the same for all. Consequently the changes in expansion must be due either to the effect of the period before calcination begins or to the duration of calcination. Three more samples were calcined for a period of 6 hours each, but the time required to reach 110 deg. C. was ½ hour, 2½ hours, and 4½ hours, respectively, as shown in Fig. 8. After removal from the calciner these batches were cooled overnight. The expansions on setting of these were measured on the following day, using mixes of standard testing consistency, with the following results:

Calcination	Total Time of Calcination	Time to Reach 110 deg. C.	Expansion
4	6 hours	0.5 hour	0.16%
5	6 hours	2.5 hours	0.17
6	6 hours	4.5 hours	0.16

A 12-kg. sample was completely calcined in 2 hours following the time-temperature curve as shown in Fig. 9. The expansion on setting of the resulting material was then measured. Nine 1-kg. batches were removed from this calcined material for subsequent

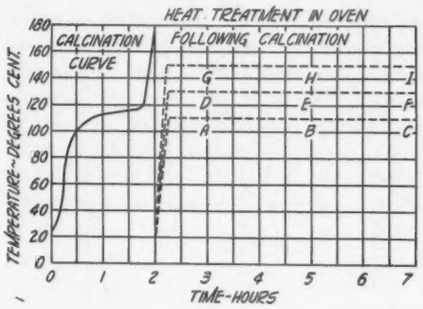


Fig. 9. Time-temperature curves for calcination No. 7

treatment. The treatment consisted of subjecting the batches to temperatures of 110 deg., 130 deg. and 150 deg. for periods of 1, 3 and 5 hours, after which the expansion on setting was measured. Finally, some of the original material, which had been calcined as above but had not had further treatment in the oven, was exposed to the air for 21 days and the expansion during setting was again determined. The results of these measurements are given in Table VI.

TABLE VI—EXPANSION ON SETTING OF MATERIAL FROM CALCINATION No. 7

12 hours after calcination.....0.16%

TREATMENT IN OVEN*

	110 deg. C.	130 deg. C.	150 deg. C.
1 hour.....	(A) 0.17%	(D) 0.12%	(G) 0.13%
3 hours.....	(B) 0.18	(E) 0.13	(H) 0.12
5 hours.....	(C) 0.16	(F) 0.11	(I) 0.12

21 days after calcination.....0.13%

*Note. (A) to (I) correspond to points similarly lettered on Fig. 9.

These results show that heating of calcined gypsum after calcination is complete, in general, decreases the magnitude of its expansion on setting, but that this decrease is also brought about by allowing the material to stand at room temperatures for a few weeks. As this sample had been exposed to the air during the three weeks between the initial and the final measurements, the possibility is present that a partial rehydration of the plaster may have taken place.

Portions of the first three calcinations had been preserved in air-tight glass jars for six weeks. The expansion of these on setting was again measured, with the following results:

Calcination No.	Duration of Calcination	Expansion on Setting—Original	Expansion on Setting—After aging 6 wk.
1	1½ hours	0.12%	0.12%
2	4½ hours	0.16	0.13
3	8½ hours	0.18	0.14

These results indicate that by calcining a sample of gypsum by various methods, materials may be produced which differ from one another in the magnitude of the expansion on setting. When the calcined materials are allowed to age, either at ordinary temperatures or at higher temperatures, the materials which produce the larger expansions on setting apparently are transformed into products which expand the same as those materials which originally showed a lower expansion on setting.

Several other calcinations were made but no appreciable difference from those reported above was found. In all cases the expansion on setting of these electrically calcined gypsum was found to be in excess of 0.10%.

H. Admixtures

The addition of certain ingredients in fairly large proportions to calcined gypsum before mixing with water presents an important method for controlling the expansion. For example, lime, which contracts as it hardens, may be mixed with calcined gypsum and smaller expansions on setting may be obtained. A 1:3 hydrated lime-calcined gypsum mix by weight, expanded 0.06%, while a 1:1 mix expanded 0.01% when setting. The effect of the addition of lime is evident when these figures are compared

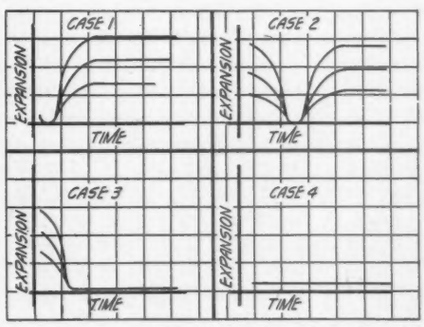


Fig. 10. Typical expansion curves for calcined gypsum during setting

with the 0.20% expansion obtained when a neat calcined gypsum sets.

Conclusions

This work has shown that the expansion of a gypsum plaster on setting may be controlled within certain limits by proper control of conditions. The results indicate that gypsum plasters may be roughly classified into one of four classes, according to the nature of the expansion. The curves representing these four classes are shown in Fig. 10. The expansion on setting of the plaster may be made to approximate the expansions shown in Fig. 10 by suitable proportioning of ingredients as follows:

Case 1. An unretarded calcined gypsum. The magnitude of the expansion was decreased by increasing the amount of mixing water, of sand or other aggregates, and by the use of coarser gypsum and aggregate.

Case 2. A retarded calcined gypsum. The magnitude of the initial contraction was decreased by preventing evaporation before

setting occurred and by increasing the amount of sand or aggregate. The magnitude of the final expansion was controlled as in Case 1.

Case 3. Admixtures. Expansions of this type were obtained when materials such as lime or clay, which shrink upon drying, were added to the calcined gypsum. The magnitude of the initial contraction increased with increasing amounts of lime.

Case 4. A limiting value of Case 3. Obtained by very close control of composition, humidity, and time of application. To obtain such an expansion in practice, a gypsum-lime sanded mix could be used and it should be applied shortly before setting occurs.

In applying these results, it must be remembered that they are only comparative. It is not to be expected that other brands of calcined gypsum will exactly duplicate the values reported. However, the changes in expansion on setting produced by varying the water content, aggregate, fineness, etc., should approximate those given herein, in the case of any ordinary "first settle" calcined gypsum.

It is desired to call attention once more to the contraction which occurred before the material set. This contraction was measurable in well over half of the specimens examined and in some cases was greater than the expansion which followed. The only cases in which the contraction was not found were those in which the set occurred shortly after mixing. It undoubtedly occurred, but the contraction was complete before the initial measurement could be made.

The question of the adhesion of a non-expanding plaster to concrete is of great importance, but it can only be answered by a series of long-time, large-scale tests and is beyond the scope of the present investigation. It is hoped that the results presented herein may be of use in the initiation of such an investigation.

Geological Features of the Magnesite Deposits of Washington

AN interesting paper covering the geology of some of the principal magnesite deposits in Washington is reported in a recent issue of *Engineering and Mining Journal*. These deposits supplied most of the magnesite needs of the country during the World War when the foreign supply was cut off. Although attention had been called to their importance as early as 1902, it was not until 1916 that the development of the deposits as a source of magnesite for refractory purposes was begun.

At the present time, the Northwest Magnesite Co. has in operation a rotary kiln plant. This was described in detail in ROCK PRODUCTS, July 10, 1926, and is of interest for it is practically the only company now supplying Washington magnesite.

The variety of magnesite found in Washington is of the coarse crystalline texture, occurring as massive beaded deposits of dolomite. The color is generally light gray, although considerable amounts are reddish brown. The variation in color and texture indicate the varying proportions of lime and silica, the chief impurities. There are no hardfast rules for recognizing the quality of the rock by sight; sampling and comparison with type samples are the means generally used.

S. S. Siegfus, the author of the above-mentioned article, cites several examples in support of the theory that the Washington magnesite was deposited directly and contemporaneously as magnesium carbonate. Bailey Willis, well known California geologist, in a letter to the *Engineering and Mining Journal* does not entirely agree with Mr. Siegfus' conclusions in regard to the sedimentary origin of the magnesite deposits. According to Mr. Willis, the problems of origin remain unsolved, though its actual condition in the formation is that of a secondary mineral, concentrated on or near faults.

German Gypsum Industry in 1927

AFTER a heavy drop in production and shipments of gypsum towards the end of 1926 and during January, 1927, the German gypsum industry under economic pressure was practically forced to mergers for the sake of self-preservation. The end of January, 1927, brought about merged sales units of the gypsum companies in central Germany, Hessen, northern and western Germany and of some companies in southern Germany. This was a means rather than an end in itself.

The decline continued throughout February and March, then conditions improved gradually until business revived and was somewhat above average by fall. However, November and December showed a reduction of sales, which is likely to last until the spring of 1928 when building activity will be resumed.

The economic conditions of the German gypsum industry are very poor compared to pre-war standards. This is due to the marked drop in exports. Before the war a large part of the output of the gypsum industry was exported. The war gave rise to new gypsum industries in different parts of the world, which endeavored to control the adjoining export fields due to low freight and shipping facilities. On the other hand, Germany is unable to compete in the world market on account of the present high freight rates to the nearest German port. Up to the present time this condition has not been balanced by domestic demands, although the gypsum industry has tried to further the use of gypsum as a structural material for many purposes.

The outlook for 1928 is not unfavorable due to increased building activity, although the capital shortage seems to become more acute and threatens to restrict building.—*Baumarkt* (1927), **50**, 1528.

Study of Hard Finish Gypsum Plasters

HARD FINISH plasters are plasters comprising gypsum anhydride mixed with some salt such as Glauber's salt ($Na_2SO_4 \cdot 10H_2O$) or alum before or after calcination. They are used chiefly for finishing walls where a dense, hard, smooth surface is desired, but as some of them have high strength relatively low porosity and low specific gravity, there is a possibility of extending their use to other phases of building construction.

Very little literature on the effects of the addition of various salts to plaster has been published so the bulletin, "A Study of Hard Finish Plasters," by T. N. McVay of the Engineering Experiment Station, University of Illinois, is a valuable contribution. In his work the author has investigated three methods of adding Glauber's salt, potash, alum and borax to gypsum. All the plasters produced by these three methods have been tested for time of set, heat of hydration or chemical combination, constancy of volume, tensile strength, shrinkage and color. An optical study of the setting of plasters, including anhydrous gypsum and Keene's cement, was almost made.

The author reviews some of the theories of plaster setting and also some of the previous work on additions to gypsum for plaster making. In his experiments he found that Glauber's salt and alum accelerated setting of rock gypsum, whereas borax acted as a retarder. The physical tests showed that a given amount of alum accelerated the set more than a like amount of Glauber's salt and under the microscope the monoclinic crystals of gypsum always appeared earlier when alum was used as an accelerator. The author found no radical departure in the mechanism of the setting of hard finish plasters from that of plaster of paris.

The conclusions drawn are given below:

Plasters of high strength may be made at a relatively low cost in commercial practice and their field of use extended. Treatment of gypsum with soluble sulphates before or after final calcination produces plasters of widely varying physical properties, the before calcination treatment causing the plasters to be more plastic but having a higher shrinkage. Potash alum in general yields more satisfactory results than Glauber's salt, but other soluble salts may be as efficient as either of these.

The physical properties of the plaster can be controlled to a considerable degree by the temperature of the calcination, assuming the concentration of the soluble sulphates to remain fixed. The higher the temperature of calcination (within these investigation limits) the slower the reactions taking place in setting. The greater strength of plasters calcined at high temperatures compared with those calcined at low temperatures is probably due to a more thorough crystallization of the former and also the smaller amount of mixing water used, this producing plasters of greater hardness and density.

Editorial Comment

A Confusion of Terms

We seem to have been guilty of confusing some not very well defined terms now currently used in the portland cement industry. However, in doing so we are not alone, but in such distinguished company as Robert W. Lesley and other leaders in the industry. In Mr. Lesley's review of the portland cement industry, ROCK PRODUCTS, December 24, 1927, p. 102, in writing of rapid-hardening cements he refers to two classes (1) "the alumina cements which are made of mixtures of bauxite (alumina) and lime," and (2) "the 'super cements' which are made of practically the same materials as the recognized, normal portland cement, but contain a slightly larger lime content and are burnt at higher temperatures and are more finely ground, both in the raw and finished state." He writes further: "Other 'super cements' are of a class to give waterproof qualities and great denseness."

Throughout our own editorial review of the portland cement industry we used the terms "quick-hardening" and "early high strength" and "super" cement more or less synonymously. We were careful in each reference to put the word "super" in quotation marks, intending thereby to distinguish a class or kind of portland cement which is generally referred to in most European countries as "super cement." Of course, Mr. Lesley, who has only recently returned from visiting with his cement-manufacturing contemporaries in Europe had in mind the same idea when he referred to "super" cements.

Both of us—and apparently almost all our correspondents, who incidentally *are* leaders in the portland cement industry—overlooked momentarily the fact that the term "super cement" in the United States cannot have legally, under our copyright laws, the same significance that it has in contemporary European technical literature. "Super cement" in this country is the copyrighted name of a specific material made by adding a patented, treated, gypsum compound known as "catacoll" to portland cement clinker before grinding. The resultant product, we are informed, gives "a better portland cement concrete at all stages of curing, and an impermeable concrete." No claims are made for "super cement" (American technical literature) as being rapid-hardening, or as having early high strength. Hence our use of the term in the sense that it is used throughout European literature is confusing.

So far as we know an American authoritative term, to apply to portland cement having the quality of hardening more rapidly than standard portland cement, has not been suggested. We are not alone in using the terms "early high strength" and "quick hardening" synonymously. Are we right or are we wrong? Since the term "super cement" is ruled out by the law of the land, which of the two terms quoted does come nearest to describing the product? We earnestly solicit some suggestions from our readers. We will do our best to stick to one term or the other, if our readers will inform which in their opinion is the proper one to use.

The Human Factor in Production

Charles M. Schwab, the great steel maker, said in an address to the American Society of Mechanical Engineers, recently:

"To make workmen contented and happy; to make them love their work and to have a personal interest in the business—that's the greatest field of engineering I ever entered."

Mr. Schwab spoke as an engineer, and he was talking to other engineers, persons who do not work on emotions and impulses but who devote their lives to the application of mathematical, physical and chemical laws to production. It is not a new thing to have such men discuss the health and contentment of workmen as a production factor, but it is sufficiently new to be "first page stuff" in the daily papers.

Apparently we are coming to a point where mechanical efficiency is taken as a matter of course. We can make machines that will do almost anything, and now we find that we must turn our attention to the men who operate them. We have gone so far along this new line that safety work is a recognized branch of engineering, and we are now coming to the point where the health and well-being of the workman will be considered as important a production factor as his safety.

It is gratifying to know that in safety and personnel work the rock products industry is at least abreast of other industries. The cement manufacturers' campaigns for safety have shown wonderful results and have set marks for other industries to reach. In personnel work, the results obtained by far-seeing men in a number of companies in the rock products industry are notable.

The effect is already plainly seen in such states as Pennsylvania, where industrial problems have been so deeply studied. Not the least of the advantages of the new way is the feeling of the men toward the management. There is no longer any talk of "grinding the faces of the poor" or of "forcing men into living conditions not fit for human beings." Instead of the old antagonism there is a feeling that both management and men have a common cause, and as for living conditions, the newer industrial villages are "show places."

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Allentown Portland Cement Co. (common)[27]	Dec. 30	.....	3	7	
Allentown Portland Cement Co. (6% bonds, 1932)[22]	Dec. 5	.....	90	92	
Alpha Portland Cement Co. (common)[2] new stock	Jan. 14	No par	38	43	75c quar. Jan. 14
Alpha Portland Cement Co. (preferred)[2]	Jan. 14	100	.....	115	1¾% quar. June 15
American Lime and Stone Co. (7% bonds, 1942)[23]	Jan. 13	.....	100½	101½	
Arundel Corporation (sand and gravel—new stock)	Jan. 16	No par	46¼	46¼	50c quar.; $1 ex. Jan. 16
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Jan. 17	.....	107	112	
Atlas Portland Cement Co. (common)[2]	Jan. 14	No par	39½	41½	50c qu. Sept. 1
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% qu. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Jan. 14	33⅓	43	.....	2% qu. Jan. 3
Beaver Portland Cement Co. (1st Mort. 7's)[3]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (Class A)[4]	Jan. 16	.....	37	37	75c quar. Oct. 31
Bessemer Limestone and Cement Co. (6½% bonds)[4]	Nov. 4	.....	100¼	101	
Boston Sand and Gravel Co. (common)	Jan. 13	100	77¼	81	$1 qu., $1 ex. Jan. 2
Boston Sand and Gravel Co. (preferred)	Jan. 17	.....	80	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	Jan. 17	.....	90	95	2% qu. Jan. 1
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	Dec. 30	.....	Called at 110		3% semi-annual A&O
Canada Cement Co., Ltd. (new common)	Jan. 16	.....	31	32	
Canada Cement Co., Ltd. (new preferred)	Jan. 14	.....	97½	98	
Canada Cement Co., Ltd. (new units)	Nov. 4	.....	107	107½	
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Jan. 14	100	96	99	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Jan. 16	No par	37½	.....	50c quar.; 50c ex. Jan. 12
Charles Warner Co. (preferred)	Jan. 16	100	108	110	1¾% quar. Jan. 26
Cleveland Stone Co. (new stock)	Jan. 16	.....	70	75	50c qu. 50c ex. Dec. 1
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Dec. 30	100	Called		
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Jan. 17	100	96	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Jan. 17	100	94	98	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	Jan. 14	100	99½	101½	
Coosa Portland Cement Co. (6% bonds, 1944)[22]	Dec. 28	.....	65	75	
Coplay Cement Manufacturing Co. (6% bonds, 1941)[32]	Dec. 28	.....	50	.....	
Coplay Cement Manufacturing Co. (common)[32]	Dec. 20	.....	11	.....	
Dewey Portland Cement Co. (1st mort. 6's 1942)[20]	Jan. 17	100	99½	101	
Dolese and Shepard Co. (crushed stone)[7]	Jan. 16	50	110	.....	1.50 Jan. 1, 1.50 ex. Jan. 1
Edison Portland Cement Co. (common)[29]	Jan. 13	.....	50c	.....	
Edison Portland Cement Co. (preferred)[29]	Jan. 13	.....	1	.....	
Edison Portland Cement Co. (bonds)[29]	Jan. 13	.....	75	.....	
Egyptian Portland Cement Co. 7% pfd.[21]	Jan. 16	.....	90	95	1¾% quar. July 1
Egyptian Portland Cement Co. (common)[21]	Jan. 16	.....	5	7	40c quar. Oct. 1
Egyptian Portland Cement Co. (warrants)	Jan. 16	.....	No market		
Fredonia Portland Cement Co. (6½% bonds, 1940)[22]	Dec. 5	.....	97	101	
Giant Portland Cement Co. (common)	Jan. 14	50	35	45	
Giant Portland Cement Co. (preferred)	Jan. 14	50	40	45	3½% Dec. 15
Ideal Cement Co. (common)	Jan. 16	No par	101	103	$1 quar.; $1 ex. Jan. 1
Ideal Cement Co. (preferred)[23]	Jan. 16	100	111	112	1¾% quar. Jan. 1
Indiana Limestone 7's (1936)	Nov. 9	.....	98	100	
International Cement Corporation (common)	Jan. 16	No par	58	60	$1 quar. Dec. 31
International Cement Corporation (preferred)[2]	Jan. 16	100	108	110	1¾% quar. Dec. 31
Kelley Island Lime and Transport Co. (new stock)	Jan. 16	100	55	56	62½c quar. Jan. 1
Lawrence Portland Cement Co.[2]	Jan. 14	100	107	110	2% quar.
Lehigh Portland Cement Co.	Jan. 14	50	125	130	1½% quar.
Lehigh Portland Cement Co. (preferred)	Jan. 14	.....	106	109	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1928 to 1931)[13]	Aug. 12	100	99½	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1932 to 1935)[13]	Aug. 12	100	97½	99	
Marblehead Lime Co. (1st Mort. 7's)[14]	Jan. 14	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Jan. 14	100	98	.....	
Michigan Limestone and Chemical Co. (common)[6]	Jan. 14	.....	35	.....	
Michigan Limestone and Chemical Co. (preferred)[6]	Jan. 14	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Jan. 16	25	41	41½	50c Nov. 1
Monolith Portland Cement Co. (common)[9]	Dec. 30	.....	13½	14	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	Dec. 30	.....	32	33½	
Monolith Portland Cement Co. (preferred)[9]	Dec. 30	.....	9¼	9¾	
National Cement Co. (7% bonds)[33]	Jan. 13	100	96	99	
National Gypsum Co. (common A)[35]	Jan. 17	.....	23	26	
National Gypsum Co. (preferred)[35]	Jan. 17	.....	68	72	
National Gypsum Co. (pref. carrying acc. div.)[35]	Sept. 15	.....	86	88	
Nazareth Cement Co.[30]	Jan. 13	No par	32	34	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Dec. 30	.....	115	.....	
Newaygo Portland Cement Co. (6½% bonds, 1938)[22]	Dec. 28	.....	101	103	
New England Lime Co. (Series A, preferred)[14]	Jan. 14	100	.....	95	
New England Lime Co. (Series B, preferred)[22]	Jan. 13	100	97	.....	
New England Lime Co. (V.T.C.)[22]	Jan. 13	.....	34	.....	
New England Lime Co. (6s, 1935)[14]	Jan. 14	100	98	100	
New York Trap Rock Corp. (6% bonds, 1946)[23]	Jan. 16	.....	101⅜	101⅜	
North American Cement Corp. 6½s 1940 (with warrants)	Jan. 14	100	80½	81	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	.....	.....	38	45	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Apr. 9	.....	8⅛	9	
North American Cement Corp. (preferred)	Apr. 25	.....	.....	.....	1.75 quar. Aug. 1
North Shore Material Co. (1st Mort. 6's)[15]	Jan. 17	100	98½	.....	
Northwestern States Portland Cement Co.[37]	Nov. 21	.....	165	170	

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder,, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS (Continued)

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Pacific Portland Cement Co. (common, new stock)	Jan. 13	.....	23	25	
Pacific Portland Cement Co., Consolidated[8]	Oct. 21	100	61¼	.....	25c mo.
Pacific Portland Cement Co., Consolidated (preferred)	Jan. 13	.....	81	82	
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[8]	Jan. 13	100	99	99¼	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Dec. 30	10	4	4⅝	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[20]	Jan. 16	100	98¼	98½	
Pennsylvania-Dixie Cement Corp. (preferred)[20]	Jan. 16	100	94¼	94¼	1¾ % Jan. 3
Pennsylvania-Dixie Cement Corp. (common)[20]	Jan. 16	.....	23	23¼	60c Jan. 3
Petoskey Portland Cement Co.[1]	Jan. 16	10	11¾	12½	1½ % quar.
Pittsfield Lime and Stone Co.[21]	Oct. 8	.....	.....	100	
Pittsfield Lime and Stone Co.[21] (common)	Oct. 8	.....	.....	25	
Riverside Portland Cement Co.	May 9	.....	165	.....	50c monthly, $1.50 ex. Aug. 1
Rockland and Rockport Lime Corp. (1st preferred)[24]	Jan. 13	100	.....	100	3½ % semi-annual Aug. 1
Rockland and Rockport Lime Corp. (2nd preferred)[24]	Jan. 13	100	.....	65	3% semi-annual Aug. 1
Rockland and Rockport Lime Corp. (common)[24]	Jan. 13	No par	.....	50	1½ % quar. Nov. 2
Sandusky Cement Co. (common)[1]	Jan. 13	100	155	.....	$2 quar.; $4 ex. Jan. 1
Santa Cruz Portland Cement Co. (bonds)[6]	Jan. 13	.....	105	.....	6% annual
Santa Cruz Portland Cement Co. (common)[6]	Jan. 13	.....	87½	.....	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Jan. 13	.....	23¼	23½	
Schumacher Wallboard Corp. (preferred)	Jan. 13	.....	26	26½	
Southwestern Portland Cement Co. (units)	May 11	.....	205	.....	
Superior Portland Cement, Inc. (Class A)[20]	Jan. 12	.....	48	49¾	
Superior Portland Cement, Inc. (Class B)[20]	Jan. 12	.....	36	38	
Trinity Portland Cement Co. (units of 1 sh. pfd. and ½ sh. com)[27]	Jan. 16	.....	153	157	
Trinity Portland Cement Co. (common)[27]	Dec. 19	.....	50	60	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	July 14	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	July 14	100	98	100	
United States Gypsum Co. (common)	Jan. 16	20	85½	86¼	40c qu. $1 ex. Dec. 31
United States Gypsum Co. (preferred)	Jan. 16	100	123½	123½	1¾ % quar. Dec. 31
Universal Gypsum Co. (common)[3]	Jan. 4	No par	3¼	3½	
Universal Gypsum V.T.C.[3]	Dec. 7	No par	3	3½	
Universal Gypsum Co. (preferred)[3]	Dec. 7	.....	32	35	1½ % Feb. 15
Union Rock Co. (7% serial gold bonds)[13]	Oct. 7	.....	Called as of Nov. 1, 1927		
Upper Hudson Stone Co. (1st 6's, 1951)[22]	Dec. 28	.....	92	.....	
Upper Hudson Stone Co. (1st 6's, 1937)[22]	Dec. 28	.....	Called		
Vulcanite Portland Cement Co. (7½% bonds, 1943)[22]	Dec. 5	100	105	109	
Whitehall Cement Mfg. Co. (common)[26]	Jan. 13	.....	150	.....	
Wisconsin Lime and Cement Co. (1st Mort. 6's, 1940)[25]	Jan. 17	100	99½	101	
Wolverine Portland Cement Co.	Jan. 14	.....	5⅛	6	15c Nov. 15
Yosemite Portland Cement Co. (Class A, common)	Jan. 4	10	6	.....	

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Asbestos Corp. of America (5 sh. pfd. and 5 sh. com.)[1]	June 22	.....	$1 for the lot		
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Blue Stone Quarry (60 shares)[2]	Mar. 16	.....	$10¼ for the lot	.....	
Coplay Cement Mfg. Co. (common)[4]	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred)[1]	Dec. 30	.....	70	.....	
Eastern Brick Corp. (7% cum. pfd.)[1]	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common)[1]	Dec. 9	10	40c	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phosphate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand and Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.)[1]	Mar. 17	.....	$12 for the lot	.....	
Knickerbocker Lime Co.(x)	June 22	.....	100	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼ % semi-annual
Olympic Portland Cement Co.(g)	Oct. 13	.....	.....	£1⅛	
Phosphate Mining Co.[1]	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.)[1]	June 23	.....	$200 for the lot	.....	
Rockport Granite Co. (1st 6's, 1934)	Aug. 31	.....	90	.....	
Simbroco Stone Co.[2]	Apr. 20	.....	12	12	
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Standard Gypsum Co. (10 sh. pfd. and 5 sh. com.)[1]	Dec. 28	.....	$35 for the lot	.....	
Tensas Gravel Co. (180 sh. com.)[1]	Nov. 17	.....	$1 for the lot	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd.)[6]	Nov. 3	.....	$1for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick)[6]	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. [1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, Penn. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

U. S. Gypsum Co. 1927 Net Income Estimated at $7,000,000

NOTWITHSTANDING keen competition in the gypsum industry in 1927, the consolidated statement of the United States Gypsum Co. and its subsidiaries for the year should show a net income in excess of $7,000,000, possibly aggregating $7,250,000 after depreciation, depletion, interest, federal taxes and all other charges. This would compare with a net income of $8,375,747 in 1926 and with record earnings of $8,414,117 in 1925.

After allowing for approximate preferred dividend requirements in 1927 the balance for the common stock would be equal to between $9.30 and $9.80 a share on 687,875 shares of $20 par common stock outstanding, based on the foregoing estimates. In 1926 the company earned $11.35 a share on the same amount of common stock and in 1925 earnings were equal to $15.45 a share on 506,915 shares of common stock. Year-end adjustments may affect the 1927 estimates to some degree.

Price competition was reflected by the company in 1927 and the showing made under the circumstances is regarded as very favorable. This competition is being continued into 1928 and may be felt for the next few months, but some improvement is anticipated in tonnages.

The next directors' meeting is scheduled for early in February, but there does not appear any reason to call for any reconsideration of extra annual distribution policy decided upon at the November meeting. The February board meeting comes when business of the company is dullest, while at the November meeting directors have some idea of year's results. For that reason it has been the policy to vote any extras at the final meeting of the year.

Reports have been circulated recently of a possible merger of United States Gypsum Co. with the Johns-Manville Corp., but these rumors, it was learned on good authority, are groundless. Neither is a consolidation being considered with any other company.—*Chicago Journal of Commerce.*

Foreign Abstracts and Patent Review

Blast-Furnace Slag as Ballast. The composition of slag from iron blast furnaces in Germany varies within the following percentage limits: 30.8—35.6% SiO_2, 9.1—12% Al_2O_3, 0.3—0.8% FeO, 1.3—3.5% MnO, 35.9—43.4% CaO, 3.7—10.2% MgO, 0.1—0.3% SO_3, 1.1—1.8% S, and 0—0.34% P_2O_5. It has a density of 3.0, apparent sp. gr. 1.14—2.95, and absorbs 1.1—2.8% of its weight of water. Its resistance to frost and to shattering during use as railway ballast is equal to that of granite, but slightly poorer than that of basalt. During the first year on the track it tends to accelerate the rusting of iron, but subsequently becomes inert. *Stahl u. Eisen* (1927) **47**, 1663-64.

Rock-Lime Brick Plant at Steinag. As good brick clay is abundant in Austria, the rock-lime brick plant Steinag in Gross-Schwechat near Vienna was first looked upon as an unwelcome intruder. However, the war brought about great changes and better times for the plant. In 1923 the Vienna municipality purchased an interest in the plant, thus insuring its future.

The plant was built in 1912 by the Röhrig and König Co. (Magdeburg) with a capacity of 50,000 brick of standard Austrian dimensions per 10 hours. It was equipped with four Röhrig and König presses and four hardening cylinders. A fifth press and an additional hardening cylinder were installed and a two-shift operation introduced when the plant faced the responsibility of supplying the city of Vienna.

As no sand is available, gravel must be broken up to the desired size by a crusher and ball mill. The lime is pulverized in a ball mill, air-separated, and then mixed dry with the pulverized gravel. The mixture is then conveyed to another mixer where water is added. The sand-lime mixture is stored in four hoppers, from which it is drawn to feed the presses.

Hardening takes place in five hardening cylinders 18 m. (69 ft.) long and 2 m. (7 ft. 8 in.) in diameter. The trucks had to be enlarged to accommodate brick of German standard dimensions used in Vienna. Each cylinder receives 13 trucks with 1050 brick German size, i.e., a total of 13,650 brick.

A 450-hp. compound steam engine, furnished by the Buckau Co., supplies the power for the entire installation and drives an alternating current generator of 125 k.v.a., which generates current for light and power, Most of the power is used in the products plant, built as an extension of the sand-lime brick plant proper since the war.

Two 10 at. two-flue boilers with 100 sq. m. heating area each and one 13 at. two-flue boiler with 100 sq. m. heating area furnish the steam for the machine and the cylinders. One of the three boilers is used as an emergency boiler. The 13 at. boiler supplies mostly the steam engine, while the 10 at. boiler feeds the cylinders. The 13 at. steam may be reduced to 10 at. and directed to the cylinders.

Most of the sand-lime brick produced is used in Vienna, where they enter all forms of construction. Paving units for street car tracks are also manufactured in the plant. They are cheaper than concrete paving units and are used exclusively in the city of Vienna.

In 1925 the company produced 20,000,000 sand-lime brick, 45,000 m. stairs, 35,000 m. pipe, 15,203 sq. m. slabs and 2000 grave stones. The last are cement products manufactured in the plant which is now considering further extensions. *Tonindustrie-Zeitung* (1927) **80**, 1461.

Effect of Pulverized Trass Admixture to Portland Cement Mortar. Frequently one encounters vague conceptions of the effect of finely ground trass in portland cement mortars. It is the best and cheapest method to counteract free lime produced as a result of the action of aggressive solutions or sea waters. The soluble silica of trass or puzzolans reacts the more readily the finer it is ground and the more intimately it is mixed with the cement.

Other mineral admixtures result only in increased density of the mix, acting as pore fillers, with its consequent advantages, but cannot prevent deterioration when free lime is formed.

Tests were made by the laboratory of the Bavarian Portland Cement and Trass Co., Möttingen, on specimens of neat portland cement, mixes of 3 parts portland cement to 1 part trass, 2 parts portland cement to 1 trass and 2 parts portland cement to 1 part trass and 1.5 parts lime hydrate, combined with standard sand to 1:3 mortar, cured 24 hours in air and the remainder in water.

The tensile strength of all specimens increased uniformly during the first two days. On the third day neat portland cement was above the other values, but was equaled on the 26th day by the 3 parts cement to 1 part trass mixture and on the 60th day by the 2 parts cement to 1 part trass mixture. The strengths of the trass mixtures continued to increase and were considerably above those of neat cement at 90 days.

It may, therefore, be concluded that during the last two months of hardening a new substance was formed in the trass mortars, which considerably benefited the hardening.

The cement-trass-lime mixture remains parallel to the neat cement mortar after 28 days. It is apparent that the action of trass is here counteracted by the addition of lime. Similar results were obtained for compressive strengths.

The effect of trass admixtures becomes evident somewhat later than in the tensile tests. Nevertheless, the curves of the trass mixtures are considerably steeper than those of neat cement after 28 days. The counteracting effect of the hydrate in the presence of trass is even more apparent here, as the curve flattens out after 28 days.

The following strengths were obtained for a mix of 3 parts (by weight) portland cement clinker to 2 trass to 15 standard sand tested up to 90 days:

Age days	Tension lb. per sq. in.	Compression lb. per sq. in.
3	170	1700
7	297	3110
28	410	5100

—*Tonindustrie-Zeitung* (1927), **87**, 1585-86.

Fused Cement from Phosphate Slags. Iron ore or scrap iron is added to reduction wells or slags containing phosphates, with further addition of alumina, lime, and silicas (optional), the amounts depending on the quantity already present in the wells and the desired cement composition. Sufficient iron is added to combine with all the phosphorus in the well. *English Patent No.* 267,518.

Insulating Materials from Dolomite, Hornblende or Other Magnesia Minerals. Minerals containing magnesium are fused and torn to threads in a stream of steam or compressed air. *English Patent No.* 277,577.

Tunnel Kiln Production of Cement. The raw material is conveyed in small wagons through a tunnel kiln in which it passes successively through a drying and causticizing zone, a clinkering zone and a cooling zone. *French Patent No.* 612,391.

Waterproof Cements and Mortars. Material such as cement or its constituents, sand, slag, ashes, shale, clay, gypsum, coke, bauxite or pyrolusite, or mixtures of these, ground very fine is added to portland cement or to unground clinker. Solutions containing alkali hydroxides, carbonates or chlorides, magnesium chloride and lime, mineral acids, oils, fats, bitumen or albumins or their decomposition products, such as lysalbic acid, may also be added. *French Patent No.* 612,129.

Plastering Mortar. Prepared mortar is treated with solid or dissolved acidic substances, such as calcium hydrogen phosphate, ammonium hydrogen carbonate, calcium hydrogen carbonate or gelatinous silica, or with insoluble unoxidizable organic substances, such as wax or mineral oils, preferably together with glycerides. The product is waterproof but allows permeation of air. *French Patent No.* 612,932.

International Standard Specifications for Portland Cement

A Critical Review of Present Standards in Vogue in 25 Different Countries

By Dr. C. R. Platzmann
Berlin, Germany

THE recent 50th anniversary celebration of the Association of German Portland Cement Manufacturers gave occasion to many statements emphasizing the importance of the introduction of standards, and to many a reference by word or in print to the fact that the German standards of 1878 were the first standards and as such greatly influenced the standards of other countries.

Fifty years have elapsed since the publication of the first standards and it seems to the point to review the present status of the cement standards problem, at the same time attempting to show why international standardizing of specifications has thus far been unsuccessful. The value of such standardizing would be apparent not only to the manufacturer of cement but also to the user.

Tabulation of Standards

In tabulating the standards of 25 different countries, using as a source of information a similar tabulation by A. C. Davis, another by Dr. R. Grün and the original specifications of different countries together with an international standards table published by the *Zement-Verlag*, Berlin-Charlottenburg, the author has made an effort to make the table as comprehensive as possible and to group the items in a way permitting an easy comparison and a clear idea of possible standardization. For this reason all values were reduced to their English-American equivalents.

Table I gives an alphabetic list of the different countries and the date when their standards were published. The organization which worked out the specifications and the governmental body which approved same are also listed. The same order is adhered to in the other tables.

Table II contains data of fineness, specific gravity and chemical composition. It will be noted that although the 178x178 and 76x 76-mesh sieves (per square inch) are used extensively, the specifications of the residue on these sieves vary greatly and without any apparent rule, and that sieves with an equal number of openings may have a different diameter of wire. Specifications of a certain wire mesh are somewhat vague, as the num-

Editor's note—This report has been revised to include the new Belgian and Canadian standards and also the Polish standards.

TABLE I

No.	Country	Edited by	Date of specification
1.	Argentina	Argentina Ministry of Public Works	1914
2.	Australia	Commonwealth Engineering Standards Association	1926
3.	Austria	Austrian Society of Engineers and Architects	1925
4.	Belgium	Ministry of Public Works	1927
5.	Brazil	Specifications of the Brazilian Railways	.....
6.	Canada	Canadian Engineering Standards Association	1927
7.	Chile	.....	.....
8.	Denmark	The Technical Society	1911
9.	Esthland	Adopted by Government's Act from March 20	1926
10.	France	Commission Permanente de Standardisation	1919
11.	Germany	Association of German Portland Cement Manufacturers	1927
12.	Great Britain	British Engineering Standards Association	1925
13.	Holland	Regulations for Reinforced Concrete	1918
14.	Italy	Italian Association for the Study of Materials of Construction	1925
15.	Jamaica	Government's Act No. 269 from May 17	1926
16.	Japan	Edited April 14, 1927	1927
17.	Norway	Ministry of Works	1917
17a.	Poland	Polish Industrial Commission	1925
18.	Queensland	Standard Specifications of the Railways Department (Brisbane Test)	.....
19.	Russia	3, U. P. S. A. Congress for Building Materials at Moscow, 25-31, 1, 1925	1925
20.	Spain	.....	1915
21.	Sweden	Swedish Association of Engineers and Architects	1924
22.	Switzerland	Swiss Society of Engineers and Architects	1919
23.	Checho-Slovakia of America	Ministry of Works	1925
24.	United States	American Society for Testing Materials	1926

TABLE IV

No.	Country	Mechanical ramming: Weight of hammer	Mechanical ramming: Height of fall	Mechanical ramming: No. of blows	Is amount of water for cement and sand mortar stated?	Tests for soundness: Le Chatelier test	Tests for soundness: Hot pat	Tests for soundness: Cold pat	Tests for soundness: Other tests
1.	Argentine	4.4 lb.	15¾ in.	120	Yes	×	×	....	....
2.	Australia	Böhme-Hammer 4.4 lb.	.....	150	Yes	×	....	×	....
3.	Austria	[1]4.4 lb. [3] 7 lb.	[1]10 in. [3]20 in.	[1]120 [3]150	No	....	×	×	....
4.	Belgium	[1]4.4 lb. [3] 7 lb.	[1]10 in. [3]20 in.	[1]120 [3]150	No	×	×	....	....
5.	Brazil	.....	.....	.....	.....	×	....	....	....
6.	Canada	.....	.....	.....	Yes	....	×	....	....
7.	Chile	.....	.....	.....	.....	....	....	....	....
8.	Denmark	Böhme-Hammer		150	Yes	×	....	×	....
9.	Esthland	Böhme-Hammer		150	Yes	×	....	×	....
10.	France	.....	.....	.....	Yes	×	....	....	....
11.	Germany	Böhme-Hammer		150	Yes	....	....	×	....
12.	Great Britain	.....	.....	.....	No	×	....	....	....
13.	Holland	[2]6.6 lb.	[2]20 in.	[1]150	No	....	×[3]	×	....
14.	Italy	[1]4.4 lb. [2]6.6 lb.	[1]10 in. [2]20 in.	[1]120 [2]160	No	×	....	....	Balls of neat cement boiled for 3 hr.
15.	Jamaica	.....	.....	.....	Yes	×	....	....	....
16.	Japan	Böhme-Hammer		150	.....	....	×	×	....
17.	Norway	Böhme-Hammer		150	Yes	×	×	×	....
18.	Queensland	.....	.....	.....	.....	×	....	....	....
19.	Russia	.....	.....	.....	.....	....	×	×	....
20.	Spain	.....	.....	.....	.....	×	....	×	....
21.	Sweden	Böhme-Hammer		150	Yes	×	....	×	....
22.	Switzerland	[1]4.4 lb. [2]6.6 lb.	[1]10 in. [2]20 in.	[1]120 [2]160	Yes	....	×	×	....
23.	Tchecko-Slowakia	Böhme-Hammer		150	.....	....	....	×	....
24.	United States of America	.....	.....	.....	Yes	....	×	....	....

× Signifies use of test mentioned.
[1] Briquettes for tensile test. [2] Briquettes for crushing test. [3] For construction in seawater.

ber of openings per square inch is not as indicative as the clear size of opening and ease of screening. From this point of view, the German method, adopted also in the United States, Esthonia, Norway and Sweden, of indicating the size of opening instead of the diameter of wire, is undoubtedly the more rational. The percentages retained on the 76x76-mesh sieve vary from 1% (Great Britain and Jamaica) to 10% (Spain). Of the 24 countries, 18 specify the per cent to be retained on the 76x76-mesh sieve, while 15 have included the 178x178-mesh sieve in their specifications and two (United States and Canada) specify the use of the 200x200-mesh sieve. In the first case the average value is 4%, while the average per cent retained on the 178x178-mesh sieve is 22%.

Standards Need Standardization

Of the 24 countries, only six have included the specific gravity and specified its value in their specifications, so that uniformity of specifications may be easily achieved here by dropping the determination of specific gravity from the standards. Thus the 1926 specifications of the United States have dropped the specification requiring a determination of specific gravity. With reference to chemical composition, almost all countries have specified the magnesia and sulfuric anhydride content. The former varies from 5 to 2%, the latter from 3 to 1.5%. Of late investigations of magnesia cements were carried out by the eminent American scien-

TABLE II. SPECIFICATION FOR FINENESS AND CHEMICAL COMPOSITION

		Fineness of cement				Chemical composition				
No.	Country	Residues Pct.	Sieve wires per inch	Dia. of wire, where not otherwise expressed per inch	Spec. grav. min.	MgO Pct.	SO_3 Pct.	Insol. residue Pct.	Loss on ignition Pct.	Useful foreign matter
1.	Argentine	30	178x178	0.0018						
		5	76x76	0.0044	.....	4	2	.....	3	.....
2.	Australia	18	178x178	0.0018	.....	4	2	.....	3	.....
3.	Austria	25	178x178	0.0020						
		3	76x76	0.0039	.....	5	2.5	.....	.....	3
4.	Belgium	18	178x178	.....	3.07	3	2.5	1.5	3	.....
5.	Brazil	2	76x76	.....	.....	3	2	1	3	.....
6.	Canada	22	200x200	0.0021	3.1	4	1.75	.....	.....	.....
7.	Chile	25	178x178	.....	.....	3	1.5	.....	5	3
		3	76x76			Seawater : 2				
8.	Denmark	3	76x76	0.0039	.....	.....	.....	.....	.....	3
9.	Esthland	30	178x178	Width of mesh						
		5	76x76	0.0085-0.0094	.....	5	2.5	.....	.....	3
10.	France	1	45x45	0.0078	.....	.....	3	.....	.....	.....
11.	Germany	5	76x76	Width of mesh 0.0087	.....	5	2.5	.....	.....	3
12.	Great Britain	10	180x180	0.0018						
		1	76x76	0.0044	.....	4	2.75	1.5	3	.....
13.	Holland	25	178x178	0.0020						
		3	76x76	0.0039	.....	5	2.5	.....	2.2	.....
14.	Italy	20	178x178	0.0020						
		2	76x76	0.0039	3	3	1.5	.....	.....	3
15.	Jamaica	10	180x180	0.0018						
		1	76x76	0.0044	.....	.....	.....	.....	.....	.....
16.	Japan	17	178x178	0.0022	3.05	3	2	.....	4	3
17.	Norway	30	180x180	Width of mesh 0.0035						
		4	76x76	0.0090	3.05	4	2.5	1.5	4	.....
17a.	Poland	20	178x178	0.0019	3.05	3	2.5	1.5	3	.....
		2	76x76	0.0058	.....	.....	.....	.....	.....	.....
18.	Queensland	18	178x178							
		3	76x76	.....	3	.....	.....	.....	.....	.....
19.	Russia	30	178x178							
		5	76x76	.....	.....	3	2.5	.....	4	3
20.	Spain	25	178x178							
		10	76x76	.....	.....	5	3	.....	.....	.....
21.	Sweden	5	76x76	Width of mesh 0.0082	.....	5	2.5	.....	.....	3
22.	Switzerland	....	.....	.....	.....	.....	.....	.....	.....	2
23.	Tchecho-Slowakia	25	178x178	0.002						
		4	76x76	0.004	.....	.....	.....	.....	.....	.....
24.	United States of America	22	200x200	Width of mesh 0.0029	.....	5	2	1.5	3	.....

TABLE V. TENSILE AND COMPRESSIVE STRENGTHS

		Tensile tests				Compression tests						Fineness of sand		
		Neat cement		Sand and cement 3:1		Neat cement		Sand and cement 3:1						
		7 days A	28 days B	7 days A	28 days B	7 days A	28 days B	7 days A	28 days B	28 days combined C				
No.	Country	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.	Side of cube in.	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.	Passes sieve	Retained on sieve	Dia. of wire in.
1.	Argentine	427	499	171	228	.....	5700	6400	.....	.....	.....	0.059 in. dia. holes	0.0393 in. dia. holes	.....
2.	Australia	.....	.....	250	325	.....	.....	.....	.....	2850	3570	20x20		0.0164
													30x30	0.0108
3.	Austria	.....	.....	260	.....	2.75	.....	.....	3150	.....	.....	0.0531 in. dia. holes	0.0305 in. dia. holes	.....
4.	Belgium	.....	.....	256	327	2.75	.....	.....	2845	4267	.....	20x20		0.0157
													30x30	0.0116
5.	Brazil	570	640	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.	Canada	.....	.....	225	325	.....	.....	.....	.....	.....	.....	20x20		0.0165
													30x30	0.0110
7.	Chile	.....	.....	*140 †170	*215 †260	.....	.....	.....	*1700 †2300 ‡1700	*2150 †2600 ‡2844	.....	.....	.....	.....
8.	Denmark	.....	.....	170	230	2.75	.....	.....	1700	2844	.....	0.0531 in. dia. holes	0.0305 in. dia holes	.....
9.	Esthland	.....	.....	200	.....	2.75	.....	.....	2000	2844	3555	0.0531 in. dia. holes	0.0305 in. dia holes	.....
10.	France	.....	.....	140	.....	1.58	.....	.....	.....	.....	.....	3 equal parts of sand passing respectively holes of 0.0787 in. dia.	0.0591 in. dia.	0.0197 in. dia.
11.	Germany	.....	.....	260	.....	2.75	.....	.....	2600	3900	5000	0.531 in. dia. holes	0.305 in. dia. holes	.....
12.	Great Britain	600	.....	325	356	.....	.....	.....	.....	.....	.....	20x20		0.0164
													30x30	0.0108
13.	Holland	.....	.....	170	.....	2.75	.....	.....	2150	.....	3555	.....	.....	.....
14.	Italy	.....	.....	260	355	2.75	.....	.....	2600	3555	.....	0.059 in. dia. holes	0.0393 in. dia. holes	.....
15.	Jamaica	600	.....	325	356	.....	.....	.....	.....	.....	.....	20x20		0.0164
													30x30	0.0108
16.	Japan	570	.....	200	300	.....	.....	.....	.....	2100	.....	20x20		0.0154
													30x30	0.0114
17.	Norway	.....	.....	199	284	2.75	.....	.....	1991	2844	.....	0.0531 in. dia. holes	0.0305 in. dia. holes	.....
18.	Queensland	450	540	200	240	.....	.....	.....	.....	.....	.....	20x20		0.0164
													30x30	0.0108
19.	Russia	.....	.....	140	200	.....	.....	.....	2000	.....	.....	.....	.....	.....
20.	Spain	†280 *170	†430	†100 *71	†215	.....	†2844 *1250	†4300	†1000 *430	†2150	.....	.....	.....	.....
21.	Sweden	.....	.....	199	284	2.75	.....	.....	.....	2844	3555	0.0531 in. dia. holes	0.0305 in. dia. holes	.....
22.	Switzerland	.....	.....	.....	315	2.75	.....	.....	.....	3700	.....	20x20		0.0157
													30x30	0.0118
23.	Tchecho-Slowakia	.....	.....	170	280	.....	.....	.....	1850	3150	3355	0.0531 in. dia. holes	0.0305 in. dia. holes	.....
24.	United States	.....	.....	225	325	.....	.....	.....	.....	.....	.....	20x20		0.0160
													30x30	0.0115

(A) One day in air, remainder in water. (B) One day in air, remainder in water. (C) One day in moist air, 6 days in water, 21 days in air.
*Quick setting. †Slow setting. ‡Seawater and reinforced concrete.

tist P. H. Bates of the Bureau of Standards. It was found that even 9% magnesia was not always detrimental to cement and that 5.6% could be used without any hesitation. If Italy, Japan, Belgium, Russia and Chile still specify a maximum content of magnesia in cement of 3%, it appears to be but an undue complication of the manufacturing process and means in a great many cases that certain materials are ruled out from use in cement manufacture. It also means that countries which are more lenient in this respect cannot export their cement to the above listed countries, as their cement would not conform to local specifications even though it were 100 times better than the domestic product. Similarly the Italian specification of a maximum content of SO_3 of 1.5% should be eliminated. Chile specifies the same percentage, while Canada requires 1.75% as the limit. The German specification, limiting the sulfuric anhydride to 2.5%, seems to be closest to actual conditions, easly achieved in practice. This is undoubtedly the reason why many other countries producing high grade cements have considered the specification of 2.5% sufficient. Loss on ignition, insoluble residue and foreign admixtures are specified in a number of countries, but are generally no longer covered by specifications. An international agreement on cement standards could easily do away with specifications for loss on ignition and insoluble residue. To guard against an excessive loss on ignition it should be required that a cement stored for a period longer than one-half to one year should be again tested to determine the standard properties.

Specifications of Quick-Setting Cements Not Needed

Table III tabulates the specifications of tests of time of set. It shows that the Vicat needle is used almost exclusively. Only the United States still requires a parallel test with the Gilmore needle. The weight and height of the specimens are generally uniform, but the method of determining initial set differs greatly. While most countries specify that the initial set be defined as the moment in which the needle no longer penetrates completely the truncated cone below, other countries specify a penetration of 35 or 39 mm. Should these differences be overcome in the future, complete chaos still reigns amid the definitions of slow-, medium- and quick-setting cements. It might be argued that specifications for quick- and slow-setting cements are unnecessary. As the quick-setting cements are of little importance in practice, a clause may be provided in the standards making shipments of quick-setting cement the subject of special agreement between consumer and manufacturer. A definition of this kind was included in the standards in Denmark and Sweden. The specification of initial set for normally slow-setting cement of one hour appears to

TABLE III. TEST FOR SETTING TIME

No.	Country	Grade of Setting	Setting time	Testing needle: Size	Testing needle: Weight	Depth of test block	Commencement of initial set reached, when needle
1.	Argentine	.....	Initial: Minimum 35 min. Final: Maximum 3 hr.	Square 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
2.	Australia	Slow	Initial: Minimum 1 hr. Final: Minimum 3 hr. Maximum 12 hr.	Square 1 mm.² area	.....	40 mm.	Fails to pass a point 39 mm. deep in test block.
3.	Austria	Quick Medium Slow	Initial: Maximum 10 min. 10 min.-1 hr. Minimum 1 hr.	Round 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
4.	Belgium	.....	Initial: Minimum 45 min. Final: Minimum 4 hr. Maximum 12 hr.	Square 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
5.	Brazil	.....	Initial: 1-3 hr. Final: 3-6 hr.	Square 1 mm.² area	300 gm.	40 mm.	.....
6.	Canada	.....	Initial: Minimum 30 min. Final: Maximum 10 hr.	1 mm.² dia.	300 gm.	40 mm.	Fails to pass a point 35 mm. deep in test block in ½ min.
7.	Chile	Quick Slow	Initial: Maximum 1 hr. Minimum 1 hr.	.....	.....	.....	.....
8.	Denmark	Ordinary	Initial: Minimum 1 hr. Final: Minimum 2 hr. Maximum 15 hr.	Square 1 mm.²	300 gm.	40 mm.	Fails to pass a point 35 mm. deep in test block.
		Spec. quick	According to requirements				
9.	Esthland	Slow	Initial: Minimum 1 hr.	Square 1 mm.² area	300 gm.	40 mm.	Fails to pass a point 35 mm. deep in test block.
10.	France	Quick Medium Slow Very slow	Initial: Minimum 5 min. 5-30 min. 30 min.-6 hr. Minimum 6 hr.	Round 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
11.	Germany	Slow	Initial: Minimum 1 hr.	Round 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
12.	Great Britain	Slow	Initial: Minimum 30 min. Final: Maximum 10 hr.	Square 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
		Quick	Initial: Minimum 5 min. Final: Maximum 30 min.				
13.	Holland	.....	Initial: Minimum 2 hr. Final: Minimum 4 hr.	Round 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
14.	Italy	Slow	6-12 hours	Round 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
15.	Jamaica	.....	.....	Round 1 mm.² area	300 gm.	40 mm.	.....
16.	Japan	Slow	Initial: Minimum 1 hr. Final: Maximum 10 hr.	1 mm.²	300 gm.	40 mm.	.....
17.	Norway	Slow	Initial: Minimum 1 hr. Final: Maximum 10 hr.	Round 1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
		Quick	To be specified in each case.				
18.	Queensland	.....	Initial: Minimum 30 min. Final: Minimum 2 hr. Maximum 8 hr.	.....	.....	.....	.....
19.	Russia	.....	Initial: Minimum 20 min. Final: Minimum 1 hr. Maximum 12 hr.	.....	.....	.....	.....
20.	Spain	Quick	5-30 min.	.....	.....	.....	.....
		Slow	Initial: Minimum 2 hr. Final: Maximum 12 hr.				
21.	Sweden	Slow	Initial: Minimum 1 hr.	Round 1 mm.² area	300 gm.	40 mm. (?)	Stops about 0.2 mm. from bottom (depth of block not specified).
		Quick	To be specified in each case.				
22.	Switzerland	Quick	Final: Maximum 2 hr.	1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
		Slow	Initial: Minimum 1 hr.				
23.	Tchecho-Slowakia	Medium	Initial: 30-60 min.	1 mm.² area	300 gm.	40 mm.	Fails to penetrate test block completely.
		Slow	Initial: Minimum 1 hr. Final: Maximum 15 hr.				
24.	United States of America	.....	Initial: Minimum 45 min. Final: Maximum 10 hr.	1 mm. dia.*	300 gm.	40 mm.	Fails to pass a point 35 mm. deep in test block in ½ min.

*Vicat needle. With Gilmore needle initial setting time is 60 min. The Gilmore needle is 1/12-in. in diameter and weighs ¼-lb. for initial setting time.

be reasonable and in agreement with practical conditions.

Table IV contains information on soundness tests and the preparation of specimens of strength tests. The old cold water soundness test, as included in the German specifications, still seems to be predominant. An equal number of countries specify the Le Chatelier test. The latter has never been popular in Germany, so that difficulty may be expected in trying to come to an agreement on this point. The boiling test, which is an accelerated soundness test, has been recently gaining in favor.

Machine-Made Briquets Recommended

In making the specimens for strength tests the Böhme hammer apparatus and the Tetmaier-Klebe ram vie with each other for first place. The method of making the specimens by hand, still in use in the United States, Jamaica and Great Britain, seems least reliable, as it involves many accidental errors and assumes that the specimens are made by the same operators, which latter condition is no sufficient guarantee of uniformity. A. C. Davis suggests the introduction of machine-made specimens in his book entitled "A Hundred Years of Portland Cement," published in 1924. In selecting between the hammer apparatus and the ram, the former undoubtedly claims preference, as the tamping of material by this method more nearly reproduces practical conditions than the work done by the ram, which yields much higher strengths than those attainable with the best tamping and mixing procedures. Only the use of the ram makes clear why Austria is able to specify 3150 lb. per sq. in. at 7 days. It is interesting to note that Australian standards do not follow the English example, but specify the use of the hammer apparatus, thus acknowledging German procedure as the most rational.

Table V gives strength values and shows that the recently adopted German strength specifications lead those of other countries. The table shows that the strengths may be compared only when consideration is given to the properties of the standard sand used. While a good many countries prescribe a standard sand passing the 20x20 sieve and retained on the 30x30 sieve, Germany, Denmark, Esthonia, Italy, Norway, Austria, Sweden, Argentine and Czechoslovakia, duly recognizing the value of a sieve analysis, specify the size of opening (as in the fineness specifications) through which the standard sand is to pass or on which it is to be retained as criterion of the grading of standard sand. Entirely discordant are the Spanish and Argentinian specifications requiring strength tests of neat cement specimens. The same is true of the determination of tensile strength on neat cement specimens (Brazil, Great Britain, Jamaica, Japan, Queensland, Spain). Most specifications emphasize the tensile strength at 7 days and the compressive strength at 7 and 28 days. The variations are still considerable, ranging between 71 and 325 lb. per sq. in. for the 7-day tensile strength and from 430 to 3150 lb. per sq. in. for the compressive strength at 7 days. Somewhat closer is the agreement between specifications of compressive strength after 28 days water curing. The combined air and water curing advocated by Germany has apparently not been widely adopted.

The tables give convincing evidence that a standardization of specifications would be confronted with many difficulties and could proceed only step by step. International standardization of fineness determinations and tests of time of set at the present writing appear to be most promising. Should the above aid the progress of standardization, the aim of this article will be achieved.

Sales of Slate in 1927

THE VALUE of the slate sold at the quarries of the United States in 1927 was $10,873,000, according to estimates furnished by producers to the United States Bureau of Mines, Department of Commerce. This was 12% less than the value reported for 1926. Decrease in demand, especially during the last six months of the year, and lower prices due to keen competition, were general in the slate industry during 1927. Quarries were reported idle, and several firms discontinued business. Consolidation among active firms was also noted.

The roofing slate sold, estimated at 450,000 squares, valued at $4,510,000, decreased 3% in quantity and 11% in value. This represents a decrease of 88 cents in the average value per square. The total sales of mill stock, estimated at 8,856,000 sq. ft. valued at $3,508,000, decreased 14% in quantity and 16% in value. Mill stock for structural slate—2,350,000 sq. ft. valued at $880,000—decreased 9% in quantity and 11% in value. Electrical slate—1,627,000 sq. ft. valued at $1,292,000—decreased 12% in quantity and 16% in value.

Mill stock for blackboards and bulletin boards—3,440,000 sq. ft. valued at $1,070,000—decreased 14% in quantity and 21% in value in 1927. Slate for school slates and for billiard table tops also showed decrease in both quantity and value. Slate for vaults and covers was the only slate product that showed increased sales in 1927. The output was estimated at 540,000 sq. ft. valued at $146,000, and represents an increase of 10% in quantity and 12% in value.

The sales of crushed slate for roofing granules and flour in 1927 were estimated at 456,600 short tons, valued at $2,775,000. This represents a decrease of 8% in both quantity and value.

The accompanying table compares the estimated sales of slate by quarrymen in 1927, by uses, with the sales in 1926.

ROOFING SLATE, MILL STOCK,* AND SLATE GRANULES SOLD IN THE UNITED STATES IN 1926 AND 1927, BY USES

	1926		1927 (estimated)	
	Quantity	Value†	Quantity	Value†
Roofing, squares	465,900	$5,079,087	450,000	$4,510,000
Approximate equivalent in short tons	157,450	.....	152,000	.....
Electrical, sq. ft.	1,857,940	1,537,034	1,627,000	1,292,000
Approximate equivalent in short tons	13,350	.....	11,800	.....
Structural and sanitary, sq. ft.	2,590,340	988,521	2,350,000	880,000
Approximate equivalent in short tons	18,550	.....	17,000	.....
Grave vaults and covers, sq. ft.	490,060	130,882	540,000	146,000
Approximate equivalent in short tons	6,900	.....	7,600	.....
Blackboards and bulletin boards, sq. ft.	3,998,800	1,356,405	3,440,000	1,070,000
Approximate equivalent in short tons	10,700	.....	9,200	.....
Billiard table tops, sq. ft.	367,220	145,457	299,000	103,000
Approximate equivalent in short tons	2,700	.....	2,000	.....
School slates, pieces	1,820,820	32,886	1,120,000	17,000
Approximate equivalent in square feet	973,770	.....	600,000	.....
Approximate equivalent in short tons	1,300	.....	800	.....
Granules, short tons	498,050	3,009,368	456,600	2,775,000
Other, short tons (estimated)	9,000	73,127	8,000	80,000
	718,000	$12,352,767	665,000	$10,873,000

*In 1926 the mill stock sold, including school slates, was 10,278,130 sq. ft., valued at $4,191,185; in 1927, 8,856,000 sq. ft., valued at $3,508,000.
†F.o.b. at point of shipment.

Defining pH Value of Soils in Terms of Agricultural Limestone

THE term "hydrogen ion concentration," in its abbreviated form known as pH, is becoming more common to define soil reaction. Farmers are beginning to use it as part of the usual "soil language" and it is important that producers of agricultural limestone understand just what pH value stands for, because, as a measure of soil acidity, the correcting amounts of limestone can be calculated.

Briefly, a pH value of 7.0 means a neutral soil; any figure smaller than 7.0 indicates an acid soil and a figure larger than 7.0 means an alkaline soil. Most of the soil experts are agreed that the hydrogen ion concentration is a fair measure of the lime requirements of the soil. Thus one method for determining soil acidity measures its pH value and gives the lime requirements as follows:

LIMESTONE REQUIREMENTS PER ACRE
(Figures from the *American Fertilizer*)

pH Range	Tons
7.0 up	None
6.8-7.0	None
6.2-6.7	0-1.5
5.7-6.1	1.5-2
5.0-5.6	2-2.5
4.9 and below	2.5-3

The enterprising producer of agricultural limestone will bear these figures in mind and when the county farm agent, farm bureaus or farmers talk acid soil he can tell them how much they need for their particular soils and more than likely sell them their needs.

New Diesel-Electric Dredge of the River Sand Co.

Long Ladder and Large Buckets Give Dredge a Digging Capacity of 300 Tons Per Hour

A NEW Diesel-electric dredge, the *Admiral,* was placed in service by the River Sand Co., of Steubenville, Ohio, December 12. It has a Diesel-electric drive and the power plant was furnished by Fairbanks, Morse & Co. The following description of the dredge is from the *F.-M. News,* the house organ of this company.

The overall length of the hull is 159 ft. and the molded length 130 ft. 10 in. The overall width is 33 ft. and the molded width 29 ft. 7 in. The hull has a center well to accommodate the 91-ft. digging ladder. The dredge draws 3.89 ft. when the fuel bunkers are half full, and in this shape weighs 858,339 lb.

The ladder has 33 buckets, each of 6½ cu. ft. capacity, which gives the boat a capacity for 300 tons per hour. With the long ladder, digging can be carried to an unusual depth, and to take advantage of this the boat has been provided with unusually long spuds, so that it can hold itself in deep water without putting out anchor lines.

The complete electrification of the dredge machinery makes it possible for one operator to control everything from the cabin, which is located on the deck house. Speaking tubes and electric signals are provided for communication between the dredgemaster and the crew.

Washing and Screening Plant Installed

As is usual with dredges of this type, a washing and screening plant is installed on the dredge so that only finished products are delivered to barges, the oversize and the waste being returned to the river. On this boat a high gallows frame has been erected to handle a system of three chutes by which barges of sand and gravel are loaded.

The power plant contains a 6-cylinder, 200-hp., 125-kw. Diesel generating set, furnishing direct current at 250v. to all motors. The engine room is unusually spacious and contains a built-in compressor and a circulating water pump, with a duplicate pump and auxiliary air compressor, in addition to the engine. The switchboard is also in the engine room, but many of the motors are controlled from push button stations near the motors. These are protected with overload and no voltage starters. All wiring is in conduits with marine fittings. To provide heat in cold weather, small electric heaters are installed at various points on the dredge.

Ample fuel bunkers have been provided so that the dredge can work through the season without taking on fuel more than once or twice.

The new dredge "Admiral" has a digging capacity of 300 tons per hour. The long ladder permits digging to unusual depths

The design of this dredge was worked out by H. G. Dohrman and W. A. Tisher, both of the River Sand Co. The company's officers are: Frank Dohrman, president; H. G. Dohrman, secretary; W. A. Tisher, treasurer and general manager, and H. H. Schaefer, vice-president.

The new Diesel-electric dredge "Admiral," recently placed in service by the River Sand Co., Steubenville, Ohio, which is equipped with a complete washing and screening plant

Sand-Lime Brick Production and Shipments in December

THE following data are compiled from reports received direct from 25 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is the same as those furnishing statistics for the November estimate published in the December 24 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

Production showed considerable decrease over the figures for September, as is to be expected at this time of the year. The drop in output amounted to approximately 25% of the production figure for November, seven plants out of the 25 reporting no production at all. Like decreases are shown in both truck and rail shipments. It is interesting to note that the estimate made for December production and shipments in the December 24 issue closely approximates the actual figures now at hand. There is, however, a marked increase in stocks on hand. Prices quoted by dealers in various parts of the country remain stationary, practically without exception.

The following are average prices quoted for sand-lime brick in December:

Average Prices for December

Shipping Point	Plant Price	Delivered
Albany, Ga.	$ 9.00	.....
Atlantic City, N. J.	14.00	.....
Buffalo, N. Y.	12.25	$16.75
Dayton, Ohio	12.50	.....
Detroit, Mich.	12.15	16.00
Detroit, Mich.	.....	15.20
Detroit, Mich.	.....	16.00
Grand Rapids, Mich.	12.50	.....
Hartford, Conn.	14.00	19.00
Hummelstown, Penn.	11.00	.....
Jackson, Mich.	12.25	.....
Madison, Wis.	12.00	13.00
Menominee, Mich.	11.00	14.50
Michigan City, Ind.	11.00	.....
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	10.00	12.75
New Orleans, La.	.....	.....
Pontiac, Mich.	13.00	15.00
Rochester, N. Y.	.....	19.75
Saginaw, Mich.	12.00	.....
Sebewaing, Mich.	.....	.....
Sioux Falls, S. D.	13.00	13.00@16.00
Syracuse, N. Y.	18.00	20.00
Toronto, Canada	13.50	16.00
Winchester, Mass.	.....	16.00

The following statistics are compiled from data received direct from 25 producers of sand-lime brick in the United States and Canada:

Statistics for November and December, 1927

	*November	†December
Production	18,086,000	13,912,100
Shipments (rail)	6,558,000	4,188,600
Shipments (truck)	11,833,000	8,693,500
Stocks	13,468,000	18,538,000
Unfilled orders	14,845,000	14,772,000

*25 plants reporting.
†Incomplete, two plants not reporting stocks and five plants not reporting unfilled orders.

Notes From Producers

The Northern Indiana Brick Co. of Mishawaka, Ind., was recently incorporated and is planning to erect a factory for the manufacture of sand-lime brick in the near future. It is expected that the new plant will have a capacity of 90,000 bricks a day, according to J. Morley Zander, president of the new company.

The Atlas White Brick Co., Atlantic City, N. J., has closed down its old plant permanently and is removing the machinery to its new plant at Berlin, N. J. The new plant is expected to be in operation early in 1928.

The Lakeland Silex Brick Co., Lakeland, Fla., will furnish brick for two public school buildings in Lakeland.

The Brick Booster of the Sand Lime Products Co. of Detroit, Mich., reports that that company is furnishing brick for the outside walls of the new Central Woodward Christian church in Detroit. The structure will be an attractive combination of Bedford stone and sand-lime brick.

The Acme Brick Co., Milwaukee, Wis., are furnishing over a million brick for the House of the Good Shepard in Milwaukee, and also has orders for supplying brick for grade schools in Whitefish Bay, Milwaukee, and Shorewood, Wis. The company also will furnish brick for the new additions to the Seaman Body Co. and Nash Motors.

The Plant City Brick Co., Plant City, Fla., is to furnish 3,000,000 brick for a new high school in Tampa, Fla. The buildings are to be completed by the beginning of the term next September.

To Improve Texas Lime Plant

SEVERAL improvements are planned by the Universal Gypsum and Lime Co. for the lime plant of the Lone Star Lime Works, Ogelsby, Texas, recently leased. A new Schulthess hydrating plant is being installed by the McGann Manufacturing Co., York, Penn., for the Universal company at the Ogelsby plant. Other changes to be made will be announced later, the company states.

F. R. McMillan Appointed to Research Division of A.S.T.M.

IT was recently announced in the *A. S. T. M. Bulletin* that F. R. McMillan, director of research of the Portland Cement Association, Chicago, has accepted appointment by the executive committee of the American Society for Testing Materials to membership on the society's committee on "Correlation of research." Mr. McMillan's long connection with research work in the fields of cement and concrete and his familiarity with the investigative work of the A. S. T. M. committees will enable him to render valuable service in promoting the research activities of the society. He will succeed F. G. Breyer, who was obliged to resign from the committee because of pressure of other duties.

Sand-Lime Brick Makes Progress in England

SAND-LIME brick were introduced in Great Britain in 1894 and, as in the United States, a long time elapsed before they came into general use. Within the past few years notable progress has been made, so that at the present time sand-lime brick in a variety of colors are available in all parts of the country. The leading manufacturer of sand-lime brick machinery in Great Britain is Sutcliffe, Speakman & Co., of Leigh, Lancashire. This concern has installed 12 plants in the United Kingdom, whose total output aggregates 1,000,000 brick per day. Three of the later installations have a capacity of about 120,000 brick per day with a single shift.

The new mechanical grab loader manufactured by the company was described in Rock Products, March 5, 1927.

It is interesting to note that the British Engineering Standards Association, which, although unconnected with the British government and corresponds to the U. S. Bureau of Standards, has now prepared a standard specification for the manufacture of sand-lime bricks.

Castalia Cement Co. Adopts Group Insurance

ANOTHER cement company to adopt the group insurance plan is the Castalia Portland Cement Co. of Castalia, Ohio, according to a recent announcement from the company's offices. All employes of the Castalia concern, both plant and office, are included under this plan. Insurance of $1,000 for each employe is provided, the total amounting to approximately $160,000.—*Sandusky* (Ohio) *Register.*

William H. Banfield

WILLIAM H. BANFIELD, owner of the National Silica Sand Co. of Mineral Ridge, Ohio, died in Cleveland on January 5, following an operation which he underwent some time ago. Mr. Banfield had been connected with the Ohio silica sand industry for many years, having first purchased land for the production of glass sand at West Austintown in 1901. He continued to develop this property, and in 1926 he bought out all the other stockholders and became sole owner of the plant. Mr. Banfield, whose home was in Steubenville, Ohio, was 76 years old.

Asbestos-Cement Panels

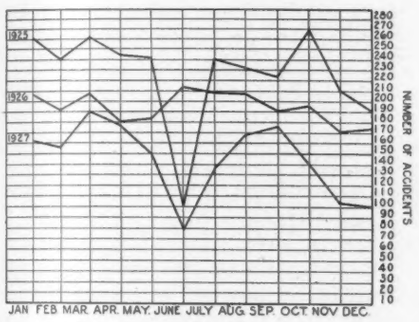
THE Beaver Products Co., Inc., Buffalo, N. Y., is to manufacture a new paneling of asbestos and portland cement under the recently acquired French "Elo" patents. Two examples of this new panel board were illustrated in Rock Products, December 24, 1927, at which time the caption misinterpreted their composition, no gypsum whatsoever being used in their manufacture.

An Outstanding Safety Year in the Portland Cement Industry

By J. Alton Reitzel
Portland Cement Association, Chicago

TEN cement mills operated throughout 1927 without a lost time accident. This record has never been equaled in the entire history of safety work in the cement industry. In 1926 only two mills were successful in completing a year's work free from accidents; two plants were similarly free from mishaps in 1925 and one in 1924.

Each of these 10 plants will receive the Portland Cement Association concrete safety trophy. The award takes the form of an 8-ton sculptured monument, appropriately inscribed, testifying to the mill's record. These awards become permanent possessions of mills winning them; in case a mill repeats its record, additional inscriptions are placed on the trophy already in its possession.



Comparative accident records, 1925-1927, inclusive

The cement mills winning the safety awards for 1927 are: Martins Creek, Penn., and Ironton, Ohio., plants of the Alpha Portland Cement Co.; Belleville, Ont., and Hull, Que., plants of the Canada Cement Co.; Bonner Springs, Kan., mill of the Kansas Portland Cement Co.; Cowell, Calif., plant of the Cowell Portland Cement Co.; New Castle, Penn., and Iola, Kan., plants of the Lehigh Portland Cement Co.; San Antonio mill of the San Antonio Portland Cement Co.; and the Duluth, Minn., mill of the Universal Portland Cement Co. Among these are two organizations which have won trophies in previous years—the San Antonio plant in 1923 and the Duluth Universal plant in 1925.

A study of the accident chart showing the record for the past three years will indicate how intense the safety work has been during 1927. Every month during the past year shows a drop in accidents over the corresponding month in either of the preceding years. As will also be noticed by the diagram, the lowest accident figure is in June. This is the month of the concentrated drive against mishaps, sponsored in both 1925 and 1927. In 1926, when the June campaign was not conducted, mishaps numbered 204. In 1925 the June figure was 92 and last year it was reduced to 68.

Here are some of the high-lights in the record for 1927:

133 mills operated during the entire month of June without a lost time accident.

50 plants of the above number had never attained a clear record during any previous month.

30 plants operated throughout January, February and March without an accident.

26 plants suffered no accidents during the first six months of 1927.

17 plants had no accidents in 10 months.

13 plants were without mishaps in 11 months.

10 mills completed the year to win trophies.

All member plants, then in operation, completed the month of September without a fatal accident, the first month without a fatality in the history of the Portland Cement Association.

These plants completed the month of June with but one fatal accident, which established a record for June and for all months up to September.

The following facts are noteworthy in connection with the association's June no-accident campaign:

85 company executives supported the June campaign with their personal written pledges.

2200 superintendents, foremen and safety committee men supported this executive action by making similar pledges and actively prosecuting the campaign.

33,000 workmen signed and returned individual pledge cards, promising to work without injury to themselves or others.

68 accidents were suffered — only 68 pledges out of a total of 33,000 were forgotten or disregarded, these amounting to about 1/5 of 1% of the total. This record shows cement mill workers about 99.83% alert and loyal —undoubtedly one of the best showings attained in any industry.

With nearly all of December accident figures reported to the association, it is estimated 1633 lost time accidents were suffered by the industry in 1927 and 30 fatalities. In 1926, 2221 lost time mishaps were recorded with 34 fatalities. While this reduction is startling in itself, another factor enters which makes figures even more significant. The 1927 safety record represents the experience of 142 mills with a far greater hazard than is represented by the 1926 figures covering only 124 plants. Indications are that 154 mills will report their accidents to the Portland Cement Association during 1928.

Trophy awarded cement mills for best safety records

The association keeps a fine statistical record of accidents—by the use of these figures a definite check can be kept on mishaps and steps can be taken for their elimination. For example, screw conveyor accidents recur each year at a certain period. By a study of the permanent record, efforts can be placed directly on this problem and effective safety work realized.

Plans for 1928 Under Way

Plans for 1928 are already getting under way. No radical departures are to be inaugurated from methods used in last year's safety work. Two types of drives will be used—the co-operative and the competitive. The June no-accident campaign will be staged again this year. This type of co-operative scheme showed excellent results in 1927 and will be further developed this coming June. Under this plan every man co-operates with all his fellow workers—the record depends on the best efforts of every man in order that his mill may keep the safety banner waving from the flagstaff. Already bulletins and posters have been mailed plants enlisting them in the 1928 trophy contest. By this method every plant is in direct competition with every other to win the coveted safety award betokening a year of safe operation.

Although 1927 has been a banner safety year, A. J. R. Curtis, assistant to the general manager, Portland Cement Association, in charge of accident prevention, has this to say about the cement industry's accident effort: "We have had a good year—but zero is the limit with us; we will not be satisfied until every man in every mill is a safe worker."

Carolina Portland to Build Mill at New Bern, N. C.

PLANS have now been completed for the construction of the proposed $3,000,000 cement plant near New Bern, N. C. (which was reported in the April 2, 1927, issue of ROCK PRODUCTS). The new mill is to be built by the Carolina Cement Co., a recently organized concern of which J. A. Acker is president, F. R. Patterson, vice-president and R. O. Clark, secretary. Mr. Acker is chief engineer of the New Egyptian Portland Cement Co. of Port Huron, Mich. The New Bern plant is to be located between the Trent river and Pembroke road, and is said to be provided with very good water, rail and highway transportation facilities. The plant will have a capacity of 1,500,000 bbl. annually. The first installation will consist of two units, with buildings sufficient to house two additional units. It is planned to have the plant in operation by September, 1928.

H. J. Bryson, North Carolina state geologist, says of the raw material for the projected mill: "The deposits of marl and shell rock outcrop along the Trent river for a distance of 10 or 15 miles and extend back from the river for a considerable distance. The company has control of the most important and most accessible deposits. There seems to be sufficient material to last for many years. Generally speaking, the overburden is light and the average thickness along the river is 20 ft., getting thicker, however, back from the stream. Analyses made by Dr. E. E. Randolph, chemical engineer, State College, Raleigh, show a calcium carbonate content of from 89% to 95%.

"The clays to be used are along the Norfolk & Southern Railway southeast of New Bern. Analyses of these clays were very favorable. Also overlying several of the marl deposits are found layers of good clay from 10 to 15 ft. thick which may be utilized later. After analyzing the materials Dr. Randolph stated that he felt the materials were suitable for making an excellent grade of portland cement."—*Manufacturers Record.*

Ideal Portland Plant at Concrete, Colo., Appraised at $1,350,000

THE "fair and reasonable value of the physical properties and business" of United States Portland Cement Co. plant at Concrete, Colo., is estimated at $1,350,000 in the report of an appraisal made in accordance with court decree, which was filed in the United States district court, December 22, 1927, by Ford, Bacon & Davis, New York engineers.

The valuation was made in connection with the case of the government against the Cement Securities Co. and others. The court entered an order June 4, 1927, for the appraisal. The property is expected to be sold in the near future, according to United States District Attorney George Stephan.

The normal productive capacity of the plant as now constituted was fixed at about 700,000 bbl. of portland cement annually, according to the report. When operated at full capacity, it was stated, about 140 men are required to run the plant.

The Concrete properties of the Ideal concern were ordered sold by Federal Judge T. Blake Kennedy of Cheyenne in December, 1924, after a decision that the Ideal, then known as the Cement Securities Co., was a trust operating in restraint of trade and in violation of the Sherman antitrust laws. Government attorneys and representatives of the company were unable to agree on the value of the plant and Judge Kennedy ordered the appraisal.—*Denver* (Colo.) *Post.*

Cape Silica Sand Co. New Plant Nearing Completion

THE Cape Silica Sand Co. of Cape Girardeau, Mo., will soon complete its new mill, which is estimated will cost approximately $75,000, including the machinery. This is only the first unit of the plant, and it is reported that two additional units will be built shortly. The estimated output of the plant will be 120 tons daily, and at the present time the railroad facilities are not sufficient to handle this amount. However, it is planned to enlarge the shipping facilities as the two proposed units are put into operation.

Metropolitan Sand Co. Formed to Distribute for Four Boston Companies

ANNOUNCEMENT was recently made of the organization of the Metropolitan Sand and Gravel Co. of Boston, Mass., as a distributing company for four sand companies in the Boston area. The new company will distribute the entire production of the Highland Sand and Gravel Co. of West Roxbury, Mass., the Needham Sand and Gravel Co. of Needham, Mass., J. H. McNamara, Inc., Watertown, Mass., and the Scully Sand and Gravel Co. of Cambridge and Arlington, Mass.

It is intended that this consolidation of sales and service will provide more economic and efficient service and delivery of material to construction jobs in all parts of Boston and the vicinity. All the plants of the four concerns, totaling an estimated investment of $1,000,000 and having facilities for 6000 tons daily, will produce material for the Metropolitan Sand and Gravel Co.

Offices of the new company will be maintained in the Park Square building. The officers are F. P. Scully, president; J. H. McNamara, vice-president, and George H. Wilbur, treasurer.—*Boston* (Mass.) *Post.*

Lehigh Portland Planning a Cleveland Plant?

THE Lehigh Portland Cement Co., Allentown, Penn., is reported to be planning to build a $1,000,000 plant in Cleveland, Ohio, on the east bank of the Cuyahoga river in the vicinity of Irishtown Bend.

This became known when City Manager Hopkins of Cleveland reported that the company had approached him with requests for the vacation of certain streets which would have to be used to put a switch track in to the proposed plant. Frederick C. Fisk, industrial engineer of the Lehigh company, was in Cleveland recently but declined to discuss the nature of the plant, although he said that it would probably cost approximately $1,000,000.—*Cleveland* (Ohio) *Press.*

Vibrating Screens at the Monroe Plant of the France Stone Co.

THE EDITOR: Mr. Schaub and I wish to apologize for not checking our drawings on the Monroe, Mich., plant of the France Stone Co. before submitting them to you for publication in your December 10 issue of ROCK PRODUCTS. We are mighty sorry that the failure to do so caused some confusion as to the make of screens being used. This can be easily explained.

The drawing on page 36 is a preliminary layout and shows as vibrator screens the Universal screen. There was no particular reason for putting this name down other than at that time we were using the Universal screen in quite a number of our plants and the name was merely used to designate a fine sizing screen, because at the time this drawing was made no one in the organization had even brought the question up as to what type of vibrator screen should be used. You will notice that the drawing at the bottom of page 38 shows Hum-mer screens. This drawing was made by a different engineer than the one who drew the layout on page 36.

We sincerely hope that this explanation is sufficient to show you that we had absolutely no intention of discriminating between the different vibrator screen manufacturers and that the names appearing on the drawings are merely indications of the screen type that was foremost in the mind of the engineer making the drawing.

The final layout of fine sizing screens includes several different makes, and we do not believe it is fair to discriminate between the makes because they are all operating under different conditions. We sincerely hope that this letter will clear matters up, and we again wish to assure you that it was an oversight on our part in the first place, to allow the drawings to go through without a thorough checking.

THE FRANCE STONE CO.,
ARTHUR C. AVRIL,
Mining Engineer.

Toledo, Ohio.

Belvedere Gravel Co. Sold to Trucking Concern

THE Owl Truck Co. of Compton, Calif., recently completed the purchase of the Belvedere Gravel Co., Los Angeles. The property acquired includes 13 acres of land, a rock crushing plant, gasoline shovels, and bunkers. The capacity of the plant is between 15,000 and 20,000 tons per month, and a fleet of 25 trucks is required to handle the deliveries. It is understood that the price paid for the Belvedere company was close to $100,000. By the addition of this important unit, the Owl company, already a large service organization, gets a Los Angeles plant through which to serve that territory. Dewey H. Burden is president of the Owl company.—*Compton* (Calif.) *News Tribune.*

U. S. Gypsum Sells Windsor Cement Co. of Boston

THE last of the retail businesses acquired by the United States Gypsum Co. in 1921 has been sold, according to an announcement from the Chicago headquarters of the company. The business is the Windsor Cement Co. of Boston, which was one in a string of retail establishments operated in the east by J. B. King and Co. The King company was purchased by the United States Gypsum Co. in 1921; since that time the U. S. Gypsum Co. has disposed of the retail establishments as rapidly as purchasers have been found.

M. T. Ryan of Boston is the purchaser of the Windsor Cement Co. of Boston. It has been announced by Mr. Ryan that the offices of the company will be retained at 18 Tremont street, but that new warehouse space, adequate for the stocking of a full line of building materials, will be procured within a short time.

Cleveland Road Show Breaks All Attendance Records

THE 25th annual convention and road show of the American Road Builders Association held recently at Cleveland, Ohio, broke all previous records for registration and attendance, the estimate indicating that fully 25,000 registered visitors attended the exhibition and convention sessions. All the exhibition space was occupied, the manufacturers displaying their products to an extent never before reached in the history of the association. Approximately $5,000,000 worth of road builders equipment was shown at the large Auditorium, the exhibition hall.

The four days' sessions were given up to meetings of delegates and engineers from different states and interesting talks on subjects covering road building from every phase of the work.

Among rock products producers who exhibited were the following: Atlas Lumnite Cement Co., Amiesite Asphalt Co. of America and the Marble Cliff Quarries Co. The latter company displayed sample bags of pulverized limestone, hydrated lime and "Scioto" rock asphalt—a combination of limestone chips, rock dust and asphalt cement prepared by a hot mixing process and subsequently cooled and granulated; the material being used for paving or patching, hot or cold laying. The accompanying illustration shows the Marble Cliff exhibit.

Marble Cliff Quarries Co. exhibit at the Cleveland Road Show

Standard Rock Asphalt Co. Buys Kentucky Concern

A PURCHASE of considerable importance was completed recently when the Standard Rock Asphalt Co. of New York City acquired the property and equipment of the Natural Rock Asphalt Co., Owensboro, Ky. The latter company had just completed its fifth and most profitable year of production, having been organized in 1922 by Phillip Grinstead, John Lessenberry and J. J. Faulkner of East St. Louis, Ill. The sale includes the transfer of quarries in Edmonson county, Ky., where the company owned about 740 acres of land containing good deposits of natural rock asphalt. There are also two steamers and 12 barges used on the Green river for transporting rock asphalt to Rockport, Ky., where it is crushed and prepared for market. The local offices of the company will be moved to Louisville, Ky., from Owensboro and general offices will be established in New York City. E. W. Sinclair, president of the Sinclair Consolidated Oil Co., is chairman of the board of directors of the Standard company, which was recently incorporated under the laws of Delaware.

Ohio River Sand Companies May Pay Royalty to West Virginia

THE sand and gravel companies that have been taking their materials from the Ohio river in West Virginia, and against whom an injunction was recently obtained by the state to prevent the removal of any more of the material, now are asking for a compromise, according to present reports. It is understood that the companies have agreed to pay a tax or royalty on all sand and gravel removed in the future. The tax the companies would agree to pay would be about 2% or 3%.

It has been estimated that a 2½% tax on the sand and gravel taken from the Ohio river would bring to the state about $150,000 in revenue annually. This, it is said, could be used for the new capitol and would operate to lower the proposed 1% tax against corporations.—*Charleston* (W. Va.) *Mail.*

Erratum

THE BENTONITE deposits of the American Bentonite Corp. are located in Weston county, Wyoming, and not at Eastatoga, Ala., as stated in ROCK PRODUCTS, December 24, 1927, and the illustrations showing the "bentonite" plant and pit at Eastatoga were those of the American company's unusual clay deposit at Eastatoga, Ala. This clay deposit is described by the U. S. Geological Survey as one of the most curious in the country, its black color being attributed to carbonaceous matter and the origin questionable. It bears no relation whatsoever to bentonite.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Dec. 17	Limestone Flux Week ended Dec. 24	Sand, Stone and Gravel Week ended Dec. 17	Sand, Stone and Gravel Week ended Dec. 24
Eastern	1,786	1,618	3,022	2,104
Allegheny	2,513	2,590	3,365	2,283
Pocahontas	225	183	593	237
Southern	364	509	8,854	6,741
Northwestern	532	631	1,272	1,119
Central Western	346	364	4,790	4,446
Southwestern	506	422	4,550	3,522
Total	6,272	6,317	26,446	20,452

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1926 AND 1927

District	Limestone Flux 1926 Period to Date Dec. 25	Limestone Flux 1927 Period to Date Dec. 24	Sand, Gravel and Stone 1926 Period to Date Dec. 25	Sand, Gravel and Stone 1927 Period to Date Dec. 24
Eastern	168,944	163,897	513,727	538,844
Allegheny	197,523	179,410	389,254	416,720
Pocahontas	25,476	24,906	45,491	47,761
Southern	32,541	29,705	630,822	615,114
Northwestern	72,295	64,560	319,445	346,771
Central Western	25,801	24,918	456,511	479,506
Southwestern	15,218	19,261	264,819	298,709
Total	537,798	506,657	2,620,069	2,743,425

COMPARATIVE TOTAL LOADINGS 1926 AND 1927

	1926	1927
Limestone flux	*537,798*	*506,657*
Sand, stone, gravel	*2,620,069*	*2,743,425*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning January 14:

CENTRAL FREIGHT ASSOCIATION DOCKET

17315. To establish on sand (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing loam, molding or silica) and gravel, carloads, Ginger Hill and Rupel, Ind., to Tucker, Ill. Rate of 110c per net ton. Present rate—139c per net ton.

17316. To amend Items 515 to 629, inclusive of C. F. A. T. B. Tariff 400J, naming commodity rates on chatts, crushed granite, broken or crushed quartz, carloads, East St. Louis, Ill., and upper east bank Mississippi river crossings to various points in C. F. A. territory by including in the commodity description "crushed stone (trap rock), carloads," subject to same minimum weight and rates.

17329. To establish on crushed stone, carloads, Keeport, Ind., to East St. Louis, Ill. Rate of $1.39 per net ton. Present rate—22½c.

17333. To establish following rates on crushed stone, carloads, from points in Ohio to New Bremen and Minster, Ohio. In cents per net ton.

To New Bremen, Ohio.

From—	Pres.	Pro.	From—	Pres.	Pro.
Bluffton	60	80	Rimer	70	90
Findlay	70	90	Arlington	70	90
Lima	60	70	Patterson Spur	70	85
Carey	70	95			

To Minster, Ohio.

From—	Pres.	Pro.	From—	Pres.	Pro.
Bluffton	60	85	Rimer	70	95
Findlay	70	90	Arlington	70	90
Lima	60	75	Patterson Spur	70	85
Carey	70	95			

17339. To establish on crushed stone, carloads, McVittys, Ohio, to Canton, Ohio (W. & L. E. Ry.), rate of 90c per net ton. Present rate—17c.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

17340. To establish on crushed stone, carloads, from Peebles, Ohio, to points in Ohio, following rates (in cents per net ton):

To—	Pres. rates	Pro. rates	To—	Pres. rates	Pro. rates
Henley	70	60	Higbys	100	95
McDermott	70	65	Chillicothe	*120	100
Rushtown	80	70	Circleville	*140	105
Portsmouth	80	75	Valley Cr.	120	115
Wheelersburg	90	80	Columbus	*140	125
Haverhill	90	85	Lynchburg 6th cl.		85
Ironton	100	90	Bloom. Jct. 6th cl.		85
N. Kenova	100	95	Black Fork 6th cl.		90
George	90	80	Jackson 6th cl.		100
Sargents	90	85	Pomeroy	210	135
Waverly	100	90	Athens	160	115

*Specific commodity rates.

17342. To establish on sand and gravel, carloads, Warsaw, Ind., to Claypool, Ind., rate of 60c per net ton. Present rate—69c per net ton.

17343. To establish on sand and gravel, all kinds, carloads, Sargents, Ohio, to destinations on the D. T. & I. R. R., B. & O. R. R. and Pennsylvania R. R., following rates (per net ton):

D. T. & I. stations—	Pres. rate	Pro. rate	D. T. & I. stations—	Pres. rate	Pro. rate
Dills	*	70	Springfield	*	100
Washington C. H.	*	70	Cove	90	70
Bainbridge	90	75	Jackson	70	75
Greenfield	*	80	Chapmans	90	75
Boyds	*	85	Crawford	*	90
Heglers	*	90	Superior	*	90
South Solon	*	95			
B. & O. stations—					
Frankfort	80	80	Roxabel	*	80
McLean	*	85	Greenfield	*	80
Washington C. H.	*	90	Farmers	*	95
High Bank	*	75	Midland City	*	100
West Junction	*	80	Richland	*	85
Byers	*	85	Hamden	*	90
P. R. R. stations—					
New Holland	*	95	Omanda	*	90
Kinderhook	*	90	Lancaster	*	95

*Class rates.

17266. To establish on crushed stone, East Fultonham, Ohio, to Barberton, Ohio, rate of 90c per net ton. Present rate, $1 per net ton.

17398. To established on limestone, ground or pulverized, carloads, minimum weight 40,000 lb., Piqua, Ohio, to Delphos, Ohio, rate of 162c per net ton. Present rate, 202c per net ton.

17399. To establish on limestone, ground or pulverized, carloads, minimum weight 50,000 lb., Piqua, Ohio, to Kewanee, Ill., rate of 360c per net ton. Present rate, 391c per net ton.

SOUTHERN FREIGHT ASSOCIATION DOCKET

37799. Molding sand, from Mt. Holly, N. C., to South Carolina destinations. It is proposed to establish the following reduced rates on sand, molding, in packages or in bulk, carloads (See Note 3), from Mt. Holly, N. C.: To Anderson, S. C., 210c; Camden and Columbia, S. C., 188c; Florence, S. C., 203c; Greenville, S. C., 188c; Marien, S. C., 203c; Rock Hill, S. C., 128c; Spartanburg, S. C., 173c, and to Sumter, S. C., 203c per net ton. Suggested rates are based 150% of the present rates on common sand.

37810. Molding sand, from Leedy, Miss., to southeastern destinations. It is proposed to establish the following rates on sand, molding (See Note 3), carloads, from Leedy, Miss.:

To—	In cents per net ton	To—	In cents per net ton
Anniston, Ala.	140	Chattanooga, Tenn.	150
Gadsden, Ala.	248	Cleveland, Tenn.	160
Talladega, Ala.	150	Knoxville, Tenn.	175
Sheffield, Ala.	90	Lenoir City, Tenn.	175
Atlanta, Ga.	165	Nashville, Tenn.	140
Columbus, Ga.	225		

The proposed rates are made in line with rates from Evansville, Ind., for equi-distances.

37895. Sand, gravel, stone, etc., between Ga. & Fla. R. R. stations and between Ga. & Fla. R. R. stations and stations on standard lines in Georgia. At present the rates on sand, gravel, stone, etc., published in Agent Glenn's I. C. C. A529, and prescribed by the Georgia Public Service Commission between stations referred to above, are higher than the rates for application over the standard lines, and it is proposed to establish rates on these commodities between Ga. & Fla. R. R. stations and between stations on the Ga. & Fla. Ry. and stations on standard lines in Georgia on basis of the Standard Lines scale (Rate Tables 1 and 2, Section 3, of Agent Glenn's I. C. C. A529), in lieu of the present rates.

37896. Sand, gravel, crushed stone, slag, etc., from Mimms, Nashville, Newsom and Johnsonville, Tenn., to I. C. R. R. local stations (in Tennessee). It is proposed to establish through commodity rates on sand, gravel, crushed stone, slag, rubble stone, broken stone and chert, in straight or mixed carloads (See Note 3), from Mimms, Nashville, Newsom and Johnsonville, Tenn., to Heneck, Richwood, Stevens Junction, Finley and Miston, Tenn., local stations in West Tennessee on the I. C. R. R., made on basis of the standard joint line mileage scale as prescribed by the Interstate Commerce Commission's Docket 17517. The proposed rates are shown below, to apply in lieu of present combination rates:

(In cents per ton of 2000 lb.)

To (Tenn.)	Mimms, Tenn.	Nashville, Tenn.	Newsom, Tenn.	Johnsonville, Tenn.
Heneck	150	145	145	125
Richwood	150	145	145	125
Stevens Jct.	150	145	145	125
Finley	145	145	145	125
Miston	150	150	145	125

37915. Marble, ground or pulverized, from Tate, Ga., to Ohio and Mississippi River crossings and Nashville, Tenn. In lieu of the Class "A" rates it is proposed to establish the following commodity rates on marble, ground or pulverized, in bags, carloads (See Note 1), from Tate, Ga.: To Covington, New Port, Louisville (See Note), Lexington, Frankfort, Henderson, Owensboro, Ky., 15c; St. Louis, Mo., and group, 19½c; Memphis, Tenn., 15c; Nashville, Tenn., 11½c per 100 lb. Proposed rates are made with relation to present rate of 15c to Cincinnati, Ohio, and Evansville, Ind.

Note—No change to be made in the present proportional rate of 12½c per 100 lb. to Louisville, Ky.

37919. Limestone, Ladds and Portland, Ga., to Edinburg Siding and McNeil Siding, N. C. Combination rates now apply. Proposed rate on limestone, ground, powdered or pulverized, carloads, minimum weight 60,000 lb., from and to points mentioned, 288c per net ton, made on the usual basis for establishing rates on this commodity between southern points.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

13660. **Gravel, screened,** not less than ½ in. in diameter, in bulk, in gondola or other open-top cars, carloads (See Note 3), from Avon, Conn., to Mansfield, Conn., $1.45 per net ton, via Willimantic, Conn., C. V. Ry. Reason—To provide a rate for new movement of traffic.

ILLINOIS FREIGHT ASSOCIATION DOCKET

1257D. **Sand,** carloads, minimum weight capacity of car, from Chicago, Ill., and points taking same rates as shown on pages 37 to 61, inclusive, of Jones' 108L, to Holly Springs, Miss. Present rate, 46c per 100 lb.; proposed, $4 net ton.

TRUNK LINE ASSOCIATION DOCKET

17356. **Sand** (other than blast, engine, foundry, glass, molding and silica) **and gravel,** carloads, (See Note 2), from Wyoanna, Penn., to Lakewood, Penn., $1.60 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from Lehighton, Germans, Penn., to Pottstown, Penn., and from Fenstemachers and Germans, Penn., to Boyertown, Penn.

17357. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from York, Penn., to Safe Harbor, Penn., 90c per ton of 2000 lb. Reason—Proposed rate is comparable with rate now in effect from York, Penn., to Harrisburg, Penn., and from North East, Md., to Oxford, Barnsley and Elkview, Penn., as per P. R. R., G. O.-I. C. C. No. 14343 and 14212.

17358. **Sand, molding, foundry, glass, engine, quartz, silex or silica,** carloads (See Note 2), from Steelton, Penn., to New York, N. Y., $3.24 per ton of 2000 lb. Reason—To establish rate which will be comparable with rates now in force from Baltimore, Md., and Cape May, N. J., to New York, N. Y., as per P. R. R., G. O.-I. C. C. No. 14343 and 14435.

17366. **Gannister stone,** carloads (See Note 2), from Mt. Union, Harbison-Walker No. 16, Flowing Springs, Moores Mills, Brookes Mills and Hannah, Penn.; to Woodlawn, Penn., $1.90 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Wolfsburg, Madley, Lower Mann, Reedsville, Denholm, Van Dyke, Penn., to Woodlawn, Penn., as per P. R. R., G. O.-I. C. C. No. 14298.

M843. **Sand, blast, engine, glass, molding, foundry or silica,** carloads (See Note 2), from Buffalo, East Buffalo and Black Rock, N. Y., to Rochester, N. Y., $1 per ton of 2000 lb., rate to apply only on intrastate and ex-lake traffic.

17373. **Ground limestone,** carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Barnestown to Roseby Rock, W. Va., inclusive, 11c per 100 lb. Reason—Proposed rates are comparable with rates now in force from York, Penn., to Martinsburg, W. Va., to same points of destination as per W. Md. I. C. C. 7770 and B. & O. R. R. I. C. C. 21047.

17374. **Ground limestone,** carloads, minmium weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to L. E. F. & C. R. R. stations, 14c per 100 lb. Reason—Proposed rates are comparable with rates from Bellefonte and Pleasant Gap, Penn., to Red Ban, Struthers, O'Donnell and Summerville, Penn., as per P. R. R. G. O.-I. C. C. No. 14567.

17384. **Gravel and sand** (other than blast, engine, foundry, silica, glass or molding), carloads (See Note 2), from Westchester Avenue, New York, N. Y., to Pougkeepsie, N. Y., $1.50 per ton of 2000 lb. Reason—Proposed rate is comparable with rates on like commodities for like distances, conditions and services.

17401. **Ground limestone,** carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Rachel and Barrackville, W. Va., 11c per 100 lb. Reason—Proposed rate compares favorably with rate from Bellefonte and Pleasant Gap, Penn., to Fairmont, W. Va., Confluence and Berlin, Penn., as per P. R. R. G. O.-I. C. C. No. 14567.

17405. **Stone, natural** (other than bituminous asphalt rock), **crushed,** N. O. I. B. N., in O. C., carloads (See Note 2), from New Hamburg, N. Y., to Pawling and Wingdale, N. Y., $1.45; Dover Furnace, Dover Plains, Wassaic, Amenia, N. Y., $1.40; Sharon, Colemans, Millerton, Mt. Riga, N. Y., $1.35; Boston Corner, Copake Falls, N. Y., $1.30; and Hillsdale, Craryville, Martindale and Philmont, N. Y., $1.25 per ton of 2000 lb. Reason—Proposed rates are fairly comparable with rates now in force from Westfield, Mass., as per B. & A. R. R. I. C. C. No. 8887.

17406. **Gravel or sand** (other than blast, engine, foundry, molding, glass, silica, quartz or silex), carloads (See Note 2), from Baltimore and Patapsco, Md., to Carlisle, Penn., $1.40 per ton of 2,000 lb., rate to expire June 30, 1928. Reason—The above rate was promulgated under Rate Proposal No. 15843 and recommended August 15, 1927, to expire December 31, 1927, and it having been developed that the road job for which this rate was inaugurated could not be completed by December 31, 1927, and it is desired to extend the date of expiration until June 30, 1928.

16871, Sup. 1. **Crude fluxing limestone,** carloads (See Note 2), from Martinsburg, W. Va., to Swedeland and Ivy Rock, Penn., $2.02 per ton of 2240 lb., applicable only when shipped in open top equipment or when shipped in closed equipment during period of car shortage when open top equipment is not available and closed equipment is furnished at carrier's option. When shipped in box cars at times other than during period of open top equipment shortage, ground limestone rates will apply.

17455. **Stone, fluxing,** carloads (See Note 2), from Atlas, Hamburg, Lime Crest and McAfee, N. J., to Palmerton, Penn., stations and Aquashicola, Penn., $1.15 per ton of 2240 lb., to be held as a maximum to intermediate points. Reason—Proposed rate is comparable with rates now in force to Bethlehem, Penn., as per L. & H. R. Ry. I. C. C. A1795.

17463. **Gravel and sand** (other than blast, engine, glass, molding or foundry), carloads (See Note 2), from Bragers, Md., to Hagerstown, Md., $1.30 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates on like commodities from Port Covington, Hancock and Bragers, Md., to points in the same general territory as Hagerstown, Md., as per W. M. R. R. I. C. C. 7847 and W. B. & A. E. I. C. C. 134.

17474. **Fluxing limestone,** carloads (See Note 2), from Honey Creek to Naginey, Penn., inclusive, to Harrisburg and Steelton, Penn., $1.01 per ton of 2240 lb. Reason—To establish rates which will be comparable with those in force from Williamson, Penn., as per P. R. R. G. O.-I. C. C. 14302.

17475. **Ground limestone,** carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Eureka, Smithton, Fitz-Henry, West Newton, Scott Haven and Willock, Penn., 11c per 100 lb. Reason—Proposed rates are comparable with rates now in force from York, Penn., and Martinsburg, W. Va., to same points as per W. Md. I. C. C. 7770 and B. & O. R. R. I. C. C. 21047, and Agent Curlett's I. C. C. A-193.

17476. **Sand** (other than blast, engine, glass, molding or foundry, quartz, silex and silica), carloads (See Note 2), from Bittinger, Penn., to Pennsylvania R. R. points between York, Penn., and Frederick, Md., rates ranging from 95c to $1.05 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for similar distances, conditions and services.

WESTERN TRUNK LINE DOCKET

5369B. **Sand and gravel** and sand and gravel pit strippings. Usual minimum weight. From Kansas producing points, also Kansas City, Mo., on joint traffic, to Missouri destinations. Present and proposed rates to a few representative points.

From Grinter, Morris, Muncie, Turner, Kan.; Kansas City, Mo.; Woodson Spur, Kan.

To—	Pres. Pro. Note B	Note C	To—	Pres. Pro. Note B	Note C
Northern Jct.	60	90	Gault	130	150
Excelsior Spgs.	80	90	Powersville	140	160
Ludlow	110	120			

From Holliday and Zarah, Kan.

To—	Pres. Pro. Note D	To—	Pres. Pro. Note D
Northern Jct.	70 100	Gault	140 160
Excelsior Spgs.	90 100	Powersville	150 170
Ludlow	120 130		

From Lawrence and Shockey, Kan.

To—	Pres. Pro. Note E	To—	Pres. Pro. Note E
Northern Jct.	80 110	Gault	150 170
Excelsior Spgs.	100 110	Powersville	160 180
Ludlow	130 140		

Rates in cents per net ton.

Note B—C. M. & St. P. 9805-I, I. C. C. B5070.

Note C—Basis Nebraska joint scale subject to Kansas scale as minimum.

Note D—Basis 10c over Turner, etc., rates, authorized by W. T. L. Rate Advice 6330.

Note E—Basis 20c over Turner, etc., rates, prescribed by I. C. C. by order in Docket 15715, November 26, 1926.

3478-A. **Sand,** carloads, from Lawrence and Shockey, Kan., to various points in Kansas and Missouri, of which the following are representative. Rates in cents per 100 lb.:

FROM SHOCKEY, KAN.

To	Pres.	Prop.
Olathe, Kan.	4½	.....
Paola, Kan.	5½	.....
Ft. Scott. Kan.	*	†7½
Arcadia, Kan.	*	†7½
Standard, Kan.	7	‡6½
Last Chance, Mo.	*	†7¼
Liberal, Mo.	*	†8

FROM LAWRENCE, KAN.

To	Pres.	Prop.
Olathe, Kan.	*	†5
Paola, Kan.	*	†6
Ft. Scott, Kan.	*	†7½
Arcadia, Kan.	*	†7½
Standard, Kan.	*	†6½
Last Chance, Mo.	*	†7½
Liberal, Mo.	*	†8

*No through rates, class or combination apply.

†Proposed rates based 1c per 100 lb. higher than rates from Kansas City, Mo., and other nearby points.

‡Lawrence, Kan., rate as maximum.

(See Note 3), but in no case the minmium weight to be less than 60,000 lb.

853G. **Stone, crushed (including broken soapstone),** (See Note 3), from Milladore, Wis., to Saginaw, Mich. Present rate, combination via variout west bank Lake Michigan ports, Manitowoc combination, $2.36 per net ton on crushed stone; proposed, $2.16 per net ton.

5319A. **Sand, gravel or stone (crushed,** chip, dust, rip-rap and rubble), carloads, from stations in Nebraska on the Missouri Pacific R. R. Corp. in Nebraska to points in Iowa. Present, through class rates or combination of local rates. Proposed—Establish the Nebraska joint line scale as published in W. T. L. Tariff 175 for distances in excess of 300 miles to and including 500 miles for application from points in Nebraska to Iowa points. Rates beyond 300 miles to be graded upward ½c for each 25 miles. Present minimums, various; proposed (See Note 3), but in no case shall the minimum weight be less than 40,000 lb.

New Scale for Southern Concrete Rates

FOLLOWING an investigation into Southern cement rates, the Interstate Commerce Commission prescribed a new scale of rates in that section, comprising both increases and reductions from the present rate scale.

Reasonable and non-prejudicial rates for the future were prescribed on cement moving from production points and seaports in Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North and South Carolina, Tennessee and Virginia and from all points of production in Illinois, Indiana, Maryland, Ohio, and Pennsylvania to destinations throughout the South.

The commission granted the fourth section relief to permit carriers having circuitous routes to meet rates over short routes at competitive points and maintain higher rates at intermediate local points and to permit short and weak lines to meet rates of standard lines at junction points and maintain higher rates at intermediate local points.

I. C. C. Recommendations

18566. Glass Sand. Rate on glass sand, from producing points in West Virginia to Millville, N. J., unreasonable to the extent it exceeded, exceeds or may exceed, for the two years prior to July 25, 1926, and for the future, $2.80 per net ton. Berkeley Springs, Great Cacapon, and Hancock are named as points of origin in the finding. Reparation should be awarded.

Finding that the rates on glass sand, from the producing points in West Virginia, to Baltimore, Md., and Alexandria, Va., were not unreasonable. Complaint recommended dismissed.

18592. Sand and Gravel. Rate from Paducah, Ky., to Menglewood, Tenn., in 1923 not unreasonable or unlawful. Dismissal ordered.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Danbury, Conn.	2.25	2.25	2.00	1.75	1.50	.....
Dundas, Ont.	.30	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@1.00	1.35@1.50	1.15@1.50	1.10@1.15	1.05@1.10	1.05@1.10
Ft. Spring, W. Va.	.50	1.45	1.35	1.25	1.20	.....
Munns, N. Y.	1.00	1.50	1.50	1.40	1.25	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@ .60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	.....
Rochester, N. Y.	1.50	1.50	1.50	1.50	1.50	1.50
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.50	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Chasco, Ill.	1.00@1.30	.....	1.00@1.15	.....	1.00@1.15	.....
Columbia and Krause, Ill.	.90@1.20	.90@1.20	1.00@1.20	1.00@1.20	1.00@1.20	1.25
Cypress, Ill.	1.25	1.15	1.10	1.00	1.00	1.00
Dubuque, Iowa (e)	.75	1.20@1.30	.....	1.20@1.30	1.20@1.25	.....
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa (f)	1.10	1.55	1.55	1.55	.....	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Mt. Vernon, Ill.	1.10@1.20	1.00	1.00	1.00	1.00	.....
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.20	1.05	1.00	.....
St. Vincent de Paul, Que.	.75	1.35	1.20	1.00	1.00	1.15
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Valmeyer, Ill. (fluxing limestone)	.90@1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.90	.90	.90	.90	.....
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75	.....	2.65	2.65	2.40	2.00
Cartersville, Ga.	1.50	1.65	1.65	1.35	1.15	.....
Chico and Bridgeport, Tex.	1.00	1.30	1.25	1.20	1.05	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Graystone, Ala.			Crusher run, screened, $1 per ton			
Kendrick and Santos, Fla.			3½ in. and less, $1 per ton			
Ladds, Ga.	.....	1.65	1.65	1.35	1.15	1.15
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.25	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35e	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30	1.00	1.00	1.00	1.00	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.00	1.75	1.55	1.25	1.25
Dwight, Calif.	1.00	1.00	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.40	1.80	1.60	1.40	1.40	.....
Oakland and El Cerito, Calif.	1.00	1.00	1.00	.90	.90	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.50@ .75	1.25@1.50	1.25@1.50	1.10@1.25	1.10@1.25	.....
Springfield, N. J.	2.10	2.20	2.10	1.70	1.70	1.60
Toronto, Ont.	.....	3.58@4.05	3.05@3.80	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.	.50	2.00	1.75@1.90	1.75@1.90	1.65@1.75	.....
Eastern New York—Syenite	.75	1.25	1.25	1.25	1.25	1.25
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.			Crushed flint rock, 2.50 per cu. yd.			
Graystone, Ala.—Granite	.50	.....	.....	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Rochester, N. Y.			Dolomite, all sizes, 1.50 per ton			
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.	.....	.....	1.40	1.25	1.25	1.25

(a) Sand. (b) to ⅜ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¾ in., 1.35. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh	4.50
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 4 mesh	1.50
Charleston, W. Va.—Marl, per ton, bulk	3.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Tex.—50% thru 50 mesh, 1.75; 50% thru 100 mesh	2.25
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; all sizes	1.25
Ft. Spring, W. Va.—50% thru 50 mesh	1.00
Hartford, Conn.—Paper bags, 4.25; cloth bags, 4.75; bulk	3.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Ladds, Ga.—Analysis, $CaCO_3$, 64%; $MgCO_3$, 32%; pulverized; 50% thru 50 mesh	1.50@ 2.75
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk, 1.75; bags	3.75
Marl—Analysis, 90% $CaCO_3$; 10% $MgCO_3$; bulk, 2:25; bags	4.00
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Middlebury, Vt.—Analysis, 90.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y.—Analysis 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio—30% thru 50 mesh	2.25
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25
Carload, 7.50; less than carload	9.00

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5%; $MgCO_3$; 90% thru 10 mesh	1.50
Brandon, Vt.—Bulk	4.00

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh	3.50
Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 100% thru 4 mesh	1.10@ 1.50
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Danbury, Conn.—Analysis, 79% $CaCO_3$, 11% $MgCO_3$; 60% thru 100 mesh; 80% thru 50 mesh; 100% thru 4 mesh; bags, 4.25; bulk	3.25
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92¼ $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va.—Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh, bags	5.00
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$; 95% thru 100 mesh; paper bags	3.50
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.	2.25
Estill Springs and Sewanee, Tenn.	1.50
Gray Summit and Klondike, Mo.	1.75@ 2.00
Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Massillon, Ohio	3.00
Mendota, Va.	2.25@ 2.50
Michigan City, Ind.	.35
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Pittsburgh, Penn.	3.00@ 4.00
Red Wing, Minn.	1.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.00@ 2.50
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Utica and Ottawa, Ill.	.75@ 1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Chippewa Falls, Wis.		.25*
Columbus, Ohio		.15@ .30
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@ 1.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Asbury Park, Spring Lake and Wayside, N. J.	.80	.70	1.25	1.50		
Attica and Franklinville, N. Y.	.95	.95	.95	.95	.95	.95
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.		1.00*		1.50*	1.75*	
Machias Jct., N. Y.	.75	.75	.85	.75	.75	.75
Montoursville, Penn.	1.00	.90	.85	.75	.75	.75
Northern New Jersey	.50	.50	1.25	1.25	1.25	
Portland, Me.	1.00	1.00	2.50		2.25	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Penn.		2.00				
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@ .80	.50@ .70	.10@ .40	.50@ .70	.60@ .80	.60@ .80
Barton, Wis.		.55	.75	.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio		.75	.75	.75	.75	
Des Moines, Iowa		.30	1.30	1.30	1.30	1.30
Eau Claire, Chippewa Falls, Wis.	1.00	.50	.65	1.05	.95	
Elkhart Lake, Wis.		.50	.50	.60	.50	.60
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00	1.00	1.00	
Hersey, Mich.		.50		.70		.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60	.75	.75	.75	.75
Joliet, Plainfield & Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50@ .60	.50@ .60	1.30	1.30	1.20	1.20
Mankato, Minn.				1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.85	.85	.85	.85	.85	.85
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.25	1.15
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Brewster, Fla.	.45	.45	2.75	2.50		
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Chattahoochie River, Fla.		.70		1.75		
Eustis, Fla.		.50@ .60				
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.00	.90@1.00		1.30@1.40		.80@ .90
Roseland, La.	.25	.15	1.25	.85	.65	
WESTERN:						
Kansas City, Mo.		.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Phoenix, Ariz.		1.00*	2.00*	2.00*	1.10*	1.00*
Pueblo, Colo.	.80	.60		1.20		1.15
San Diego, Calif.		.40@ .50	.80@1.00	.80@1.00	.65@ .80	.65@ .80
Seattle, Wash.	1.00	1.00	1.00	1.00	1.00	1.00
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Des Moines, Iowa	.50					
Dresden, Ohio	.50	.60	.70	.65	.65	.60
East Hartford, Conn.	.85*d					
Eau Claire, Chippewa Fls., Wis					.65	
Gainesville, Texas						.55
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	1.25‡					
Mankato, Minn.	.30					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ¼-in. down. (b) River run. (c) 2½-in. and less ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramec River.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.00	2.00	2.00@2.25	1.50		4.00	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75	1.75		1.75	1.75@2.00		
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Cedarville and S. Vineland, N. J.				2.25			
Columbus, Ohio	1.50@2.00	1.25@1.50	2.00	.30	1.75@2.00	2.75@4.50	
Dresden, Ohio	1.50@1.75	1.35@1.50	1.50@1.75	1.25	1.35		
Eau Claire & Chippewa Falls, Wis. (e)						3.00	3.00
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Klondike, Mo.				2.00	2.00		2.00
Massillon, Ohio	2.25	2.25		2.50	2.50		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30@ .35			
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.35@1.60			
New Lexington, O.	1.75	1.25					
Ohlton, Ohio	1.75b	1.75b		2.00b	1.75b	1.75b	
Ottawa, Ill.						3.50	
Red Wing, Minn. (d)					1.50	3.00	1.50
Round Top, Md.				1.60		2.25	
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Potters' flint, 7.00@12.00						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.50*2.00	1.50*@2.00	1.75	1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Damp. (c) Shipped from Albany. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*		1.45*	
Jackson, Ohio	2.05*	1.05*	1.55*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[5]	8.50	14.00
Lime Ridge, Penn.					5.00[2]			
Pittsburgh, Penn.	12.50	8.50	8.50		9.00	11.00		
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.			10.00				6.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.50	8.50				8.00	
Cold Springs and Gibsonburg, Ohio	11.50	8.50	8.50		9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio[6]	11.50							
Milltown, Ind.		8.50@10.00		10.00[3]			8.50[12]	1.35[10]
Scioto & Marble Cliff, O.		8.50	8.50	8.50	8.25	.62½	7.50	1.50[2]
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	8.50	8.50	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							7.00	
Frederick, Md.		9.00	9.00	9.50	7.50	9.00	7.50	9.00
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	20.25	9.00@10.00	9.00	9.00			8.50	1.50
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00		9.50	
Ocala, Fla.		11.50	10.00				12.00	1.30
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Cirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	19.00	19.00	14.00		16.20		12.50	2.50
Dittlinger, Tex.		12.00@13.00					9.50[3]	1.50[10]
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[10]	2.15
Tehachapi, Calif.[13]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [15] To 9.00. [16] To 1.60. [17] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.10
Ohlton, Ohio	*1.75@ 2.00	*1.75
Red Wing, Minn.		1.00
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50	3.50
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel crayons, gross	1.00@ 2.80
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (150-200 mesh)	10.00
Pencils and steel crayons, per gross	1.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.00@10.00
Same, burlap bags, bags extra	8.00@ 9.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5.00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Glendon, N. C.:	
Ground talc (150-200 mesh), bulk	6.00@10.00
Ground talc (150-200 mesh), bags	8.00@14.00
Pencils and steel crayons, gross	1.05@ 2.00
Blanks, .08 per lb.; cubes	50.00
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bags	9.50@14.50
Joliet, Ill.:	
Crude talc	5.00
Southern talc	17.00
Illinois talc	10.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-68%	3.75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00
Ground Rock (2000 lb.)	
Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72.5%	9.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50@24.00
Roofing mica	37.50
Punch mica, per lb.	.12
Cut mica—50% from Standard List.	

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	.....	10.50
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.— All colors and sizes	§3.00	§3.00
Buckingham, Que.—Buff stucco dash	.....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks, f.o.b. quarries	.....	17.50
Crown Point, N. Y.—Mica spar	.....	9.00@10.00
Dayton, Ohio	.....	6.00@24.00
Easton, Penn.— Green stucco	.....	12.00@18.00
Green granite	.....	14.00@20.00
Haddam, Conn.—Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash	.....	10.00@20.00
Middlebrook, Mo.—Red	.....	20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	.....	5.50@ 7.50
Milwaukee, Wis.	.....	14.00@34.00
New York, N. Y.—Red and yellow Verona	.....	32.00
Phillipsburg, N. J.—Royal green granite	.....	15.00@18.00
Randville, Mich.— Crystalite crushed white marble, bulk	4.50@ 6.00	4.50@ 7.50
Rose pink granite, bulk	.....	12.00
Stockton, Calif.—"Natrock" roofing grits	.....	12.00@18.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	.....
Wauwatosa, Wis.	.....	20.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 17.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Bristol, Tenn.—Color, white; analysis, K_2O, 6 to 10%; Na_2O, 2½ to 4%; SiO_2, 68 to 78%; Fe_2O_3, 12 to 20%; Al_2O_3, 16.5 to 18.5%; 99% thru 200 mesh; bulk, depending on grade	14.50@18.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% thru 60 mesh, bags	16.00
96% thru 150 mesh, bags	28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; crude, bags, 12.25; bulk	11.05
Pulverized, 95% thru 200 mesh; bags, 19.73@22.00; bulk	18.73@20.70
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk	18.00
Crude	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Brandon, Vt.	10.00
Cartersville, Ga.—(Limestone), per bag	2.25
Centerville, Iowa—(Gypsum), per ton	18.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.—(Limestone), bulk	6.00@ 7.00
Easton, Penn.—Per ton, bulk	3.00
Joliet, Ill.—(Limestone), bags, per ton	4.50
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton	15.00
Gypsum, Ohio—(Gypsum), per ton	10.00
Hartford, Conn.	‡7.50@*9.00
Limestone, Wash. — (Limestone), per ton	12.50
Los Angeles, Calif.	18.55
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	10.00
Warren, N. H.—(Mica), per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone), bulk	‡7.50@*9.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	9.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	16.00
Farmington, Conn.	13.00
Flint, Mich.	¶12.00@17.50*
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	12.75@16.50‡
New Brighton, Minn.	10.00
Pontiac, Mich.	19.75
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	16.00@18.00
Toronto, Canada	16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	14.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M., 10 days. ‡L.C.L.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.15@2.25
Birmingham, Ala.	.....	2.10
Boston, Mass.	.....	2.13@2.23
Buffalo, N. Y.	.....	2.20@2.30
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	.....	2.23
Cleveland, Ohio	.....	2.24
Chicago, Ill.	.51¼	2.05
Columbus, Ohio	.57¼	2.29
Concrete, Wash.	.....	2.35
Dallas, Texas	.....	2.00
Davenport, Calif.	.....	2.45*
Davenport, Iowa	.....	2.24
Dayton, Ohio	.58¼	2.33
Denver, Colo.	.66¼	2.65
Des Moines, Iowa	.....	2.05
Detroit, Mich.	.....	2.00
Duluth, Minn.	.....	2.04
Houston, Texas	.....	2.00
Indianapolis, Ind.	.54¼	2.19
Jackson, Miss.	.....	2.30
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.03@2.13
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.	.....	2.10
Milwaukee, Wis.	.....	2.00@2.20
Minneapolis, Minn.	.....	2.12@2.22
Montreal, Que.	.....	1.36
New Orleans, La.	.....	2.07
New York, N. Y.	.....	1.93@2.03
Norfolk, Va.	.....	2.07
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.22
Philadelphia, Penn.	.....	2.11@2.21
Phoenix, Ariz.	.....	3.26
Pittsburgh, Penn.	.....	2.04
Portland, Colo.	.....	2.80
Portland, Ore.	.....	2.60‡@2.70
Reno, Nev.	.....	2.91
Richmond, Va.	.....	2.24@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.21
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.51¼	2.05
St. Paul, Minn.	.....	2.12@2.22
Seattle, Wash.	.....	2.50†@2.65
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20
Topeka, Kan.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.12
Winston-Salem, N. C.	.....	2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.	.....	1.80
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.45*
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.90
Hudson, N. Y.	.....	1.75
Leeds, Ala.	.....	1.65
Lime and Oswego, Ore.	.....	2.70‡
Mildred, Kan.	.....	2.35
Nazareth, Penn.	.....	2.15
Northampton, Penn.	.....	1.75
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.85
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	2.30

NOTE—Add 40c per bbl. for bags.

*Includes sacks.
†10c discount, 10 days. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¾x32x 36". Per M Sq. Ft.	¾x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	12.50	.....	8.25	.....	.....	14.00	15.00	33.61
Douglas, Ariz.	.....	.....	6.00	14.50	15.00	.....	18.00	.....	30.00	.....	.....	.....	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio	3.00	4.00	6.00	7.00	9.00	9.00	18.00	7.00	27.50	19.00	.....	.....	.....
Los Angeles, Calif.	.....	.....	7.50@9.50	11.50y	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	9.00	13.40	14.40	.....	15.40	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.60	10.00	10.00	13.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	17.00c@19.00a	.....	.....
Detroit, Mich. (d)	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	.16@ .18	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind	.13@ .15†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.90	7¾x3½x12—65.00	
Oak Park, Ill.	20.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00

Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00

Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Grand Rapids, Mich.:	
5x8x12	8.00
5x4x12	4.50
Longview, Wash.:	
4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.:	Per 100
5x8x12	78.00
Grand Rapids, Mich.:	Per 100
5x8x12	7.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	.....	14.00@23.00
Oak Park, Ill.	.....	42.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	17.00	25.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Grand Rapids, Mich. (b)																	
Culvert pipe	.....	.....	.....	.60	.72	1.00	1.28	1.60†	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Sewer pipe (d)	.....	.....	.....	.....	.....	.63	.....	.60†	.....	.....	.....	.58	.....	.....	.....	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.							Sewer pipe 40% off list; culvert—list										
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.							6 in. to 24 in., $18.00 per ton										
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.							1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

(a) 24-in. lengths; (b) Reinforced; (d) Eastern clay, list, 72% and 60% off.
†21-in. diam. ‡Price per 2-ft. length.

Empire State Gravel Men to Hold Annual Meeting

THE ANNUAL meeting of the Empire State Sand and Gravel Producers Association will be held at the Chamber of Commerce building, Rochester, N. Y., on January 24. There will be morning and afternoon sessions at which time problems of the industry will be discussed and following the sessions a short business meeting and election of officers for the ensuing year. All sessions except the business meeting are open to interested parties. Stanton Walker, director of research, National Sand and Gravel Association, will be one of the speakers and other speakers have been scheduled.

Fire Damages Buffalo Cement Co. Plant

FIRE wrecked a considerable portion of the main plant of the Buffalo Cement Co., Buffalo, N. Y., on January 10, causing a property loss estimated at $50,000. The fire started in the crushing department, and was reported to have been caused by an explosion of dust. Although there were a number of workmen in the building at the time, they were able to escape, and no one was injured.

Although the fire was brought under control within half an hour, there was considerable danger that the other buildings of the company would take fire before the blaze could be controlled. All the fire companies in that section of the city were called upon to fight the flames.

Gravel Specifications Bulletin

THE Engineering and Research Division of the National Sand and Gravel Association, Washington, D. C., has recently gotten out a pamphlet summarizing all of the highway specifications for gravel for concrete pavement construction in the various states. In this short bulletin is included all of the available data on the latest requirements of the highway departments of every state, making it a valuable sheet for all producers to have. The pamphlet may be obtained by addressing the association's offices in the Munsey building, Washington, D. C.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

A Large Mid-Western Concrete Pipe Plant

Illinois-Wisconsin Concrete Pipe and Tile Company Finds Advantages in Locating Near a Source of Good Aggregate

IT is said that Harry Lauder was once asked what he did with his worn-out razor blades, to which he replied that he shaved with them. For sand and gravel companies, it is frequently a problem to know what to do with worn-out gravel pits, which, if left as they are, become a liability both to the company and to the community. At South Beloit, Ill., just across the state line from Beloit, Wis., the question has been answered in the terms of the famous Scotchman—the abandoned pit is being used. Instead of the pit being a detriment to the community and to the gravel company it has become a very valuable asset to both.

The Atwood-Davis Sand Co. of Beloit, Wis., has a large pit at its washing plant at South Beloit which is now completely worked out, and the company has transferred its operations to an adjacent location. The abandoned pit is about half a mile long and two or three hundred yards across, a sizeable piece of land to be left vacant. To prevent the property from remaining idle, it has been leased to the Illinois-Wisconsin Concrete Pipe and Tile Co. of Beloit, a company which in its organization is very closely connected with the gravel company through persons having interests in both companies.

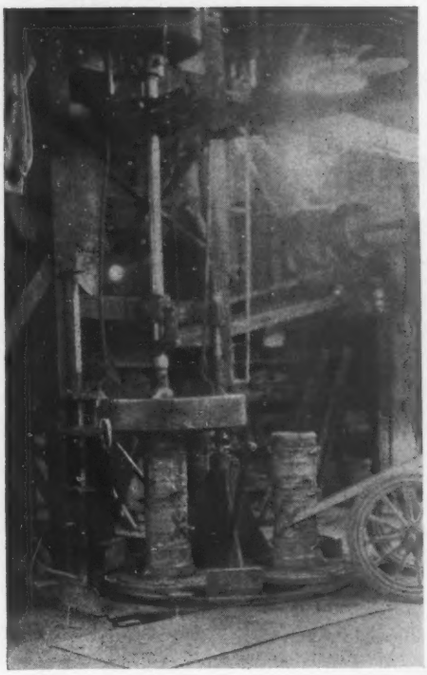
The Illinois-Wisconsin company is one of the largest manufacturers of concrete pipe in the United States. The plant of the company, including storage yards and railroad switch tracks, covers the entire level area of the bottom of the old ground pit. Located as it is, adjacent to the washing plant of the Atwood-Davis company, it benefits by the proximity of a good grade of aggregates, for all the material for the pipe, except cement, comes directly from the gravel company. Officials of the products company point out that this location permits them to get gravel at once when it is needed, that there are no freight charges, that the switching costs are small, since the sand is delivered right to the hoppers by the locomotive cranes of the sand company without the necessity of any elevating equipment, and that there is no frozen material, due to several days' exposure while being shipped.

Present gravel pit of the Atwood-Davis Co. showing conveyor used in stripping

The Atwood-Davis sand washing plant. The building at the right is the crusher house

Plant Buildings

There are two main buildings in the plant, situated beside the main switch track which leads to the sand plant. Parallel to the track, and also adjacent to the buildings, there is a private concrete road, constructed by the sand company, for the use of truck traffic, so that the shipping facilities of both the products plant and the sand plant are excellent. The larger of the two main buildings is the plant used for making pipe up to 24 in. in diameter. The main portion of this building, slightly higher than the balance of the structure, contains the pipe machinery and mixers, while a long wing at the east end and another off the north side

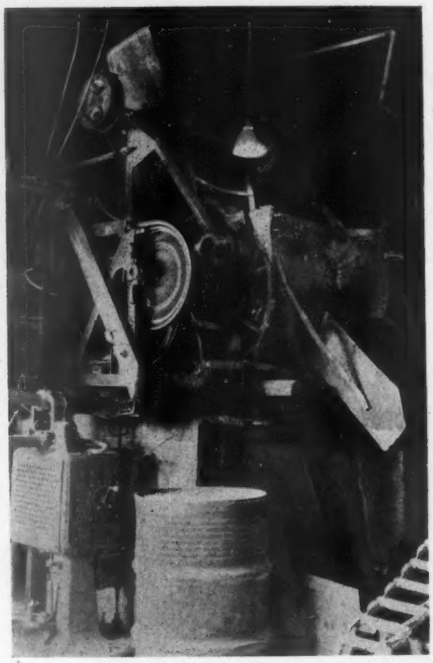


Pipe machine for pipe up to 24-in. Type of kiln cart shown at the right

contain the curing rooms. These latter are one-story, flat-roofed additions. The east wing is made up of three kilns each 20 ft. by 120 ft., while the north wing also contains three kilns, but these are 40x140 ft. At the west end of the building, and immediately beside the switch track are the aggregate hoppers, made of concrete, and as tall as the building itself. There are five square bins formed by partitions within the outer walls of the hopper. The office of the plant is also in this larger building.

The other main building of the plant is used for making pipe between 24 in. and 48 in. in size. It is just south of the larger building, and situated similarly beside the switch track. It has five curing rooms, each 30x100 ft. and there is a tall hopper at the west end divided into two square aggregate bins.

The sand and gravel is brought from the bins of the Atwood-Davis company in 50-yd. gondola cars and unloaded by a 1½-yd. Ohio locomotive crane directly into the aggregate bins. From the bins it is taken to the mixers directly as needed. Cement is unloaded from the railroad cars directly on to small flat cars which hold 40 sacks each. These cars run on tracks behind the mixers, and the cement is left on the cars until it is used. This method does away with the necessity of piling the bags, and also assures that the cement will be used



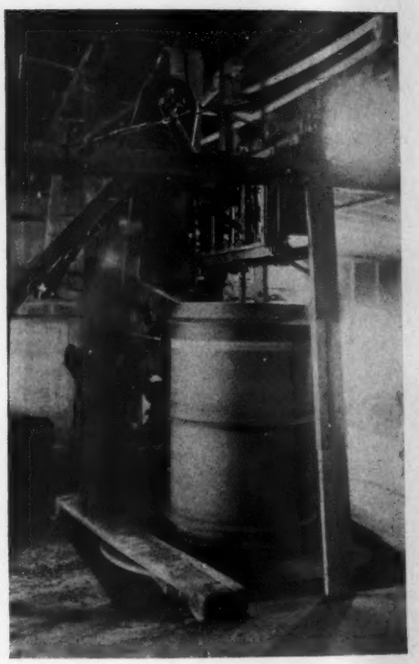
Mixer for 24-in. to 48-in. pipe

in the order in which the shipments arrived. (Frequently when cement is piled, the bottom sacks are not used for some time while bags on top are used immediately.)

Making Smaller Sizes of Pipe

The McCracken system of pipe construction is used by the Illinois-Wisconsin company for the smaller pipe. In this method, an outer mold is used but there is no inner mold. A revolving plunger, the size of the required inside diameter, passes down through the form and forces the concrete in the mold out against the sides, forming a smooth inner surface for the pipe. The machine used for this work is a McCracken pipe machine for sizes of 6 in. to 24 in. It has a circular table on the level of the floor, with places to set three pipe forms. One of the forms stands under the plunger while a second is in a free position where the finished pipe can be removed and a new mold put in its place. The table turns when the plunger completes one pipe so that the next mold is brought directly under the plunger. Thus a continuous run of pipe can be kept up from the machine.

The machine used for making pipe of 4-in. diameter and smaller is also a McCracken. It is used to make Y-branches, T-branches, and ⅛ bends, as well as the small pipe. Both of the machines are supplied with concrete from a 14-ft. Blystone mixer located between the two machines. The material for the larger of the two machines is carried up to it by a chain elevator from a pit in front of the mixer. A Worth sack cleaner has also been installed in this department.



Making 36-in. pipe

Plant and storage yard of the Illinois-Wisconsin Concrete Pipe and Tile Co., South Beloit, Wis. The plant is located in the

Unloading sand at the plant for small pipe. Note the chimney at the right constructed by using pipe forms

Pipe is transported in the storage yard by tractors fitted with trailers

An interesting feature noted at this plant was the type of pipe cart used for taking the pipe molds to the kilns. The cart used is of the usual kind except that the regular heavy wheels have been removed and a pair of Ford automobile wheels substituted. These easy-rolling, rubber-tired carts make for greater speed in taking the pipe to the kilns with less danger of injuring the pipe.

All of the machinery for smaller pipe—the mixer and the two pipe machines—is run from the same 50-hp. Fairbanks-Morse motor. The steam plant for furnishing steam to the kilns is also in this same large room. A Kewanee boiler is the chief unit, but it was found necessary to add another unit, and a boiler from an old Marion steam shovel was installed and has proved very satisfactory.

Large Size Pipe

The machine for pipe from 24-in. to 48-in. was made by the Quinn Wire and Iron Works. This machine has a revolving table on which both outer and inner molds are placed and is fitted with plungers which tamp the concrete as it flows into the form. Concrete is supplied from a 14-ft. Blystone mixer, fitted with a Wonder skip. The material is raised to the machine from a pit in front of the mixer by a chain elevator. A 10-hp. General Electric motor supplies power for the pipe machine and mixer.

The large size pipe is re-inforced with a framework of wire. The rolls for shaping this reinforcing were made by the Hendley-Whittemore Co. of Beloit. A spot welding

Mixer used for the largest size pipe

machine made by the Taylor Welder Co. of Warren, O., is used to fasten the side of the roll to make it into a complete circle.

The pipe larger than 48-in. is made outdoors. Generally no pipe is made larger than 72-in., but the company has facilities for making pipe as large as 108-in. in diameter. The mix for these pipes is prepared in a No. 7 Wonder mixer set up beside the building for 24-48-in. pipe. The mixer is operated by a 10-hp. General Electric motor.

The Illinois-Wisconsin Co. uses two cranes in handling its large size pipe. There is a 3½-ton Shaw crane in the building used for large pipe, and the crane-way extends out of the building and completely across the yard of the company. The other crane is a 3½-ton P. & H. crane installed beside this building, and also completely crossing the yard. It serves the mixer for the largest sizes, as well as being used for moving and loading pipe. It is fitted with a long steel hook which easily picks up any size of pipe to transport where desired. A 20-hp. Fairbanks-Morse motor runs the generator for the two cranes.

Pipe Making Processes

The Illinois-Wisconsin company makes a very good advertising point out of its guaranteed use of washed and carefully graded aggregates. Naturally it is possible to do this when the sand company is so close that its methods can be observed at any time. The mix used by the company is one part of

old pit of the Atwood-Davis Sand Co., whose plant can be seen in the background to the left of the pipe company's buildings

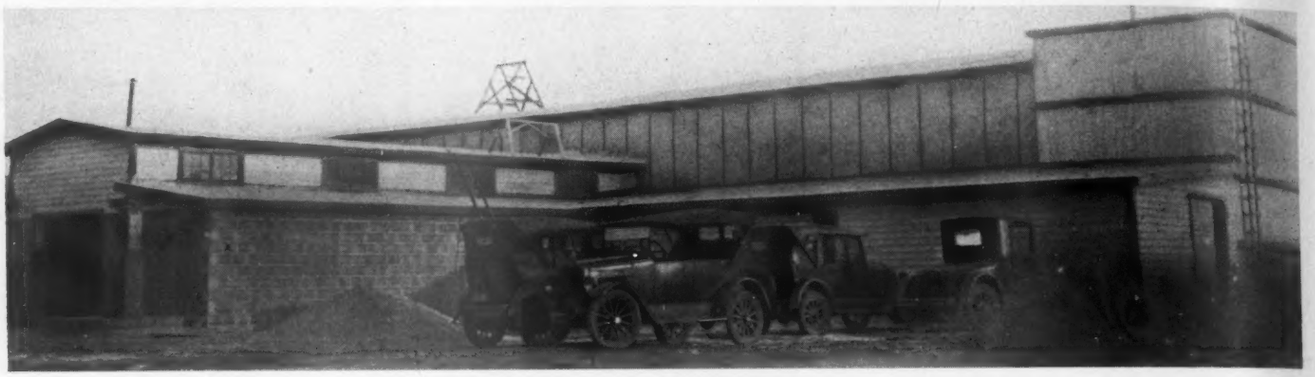
cement to three parts of aggregate for the smaller size pipe, and one part of cement to four parts of aggregate for the larger sizes. Very little "pea" gravel is used in the sizes less than 24-in., but considerable is used in sizes above 24-in. and some No. 6 gravel is also used in the large pipe.

The pipe is left in the curing room from three days to a week, depending on the size of the pipe. The larger the pipe, generally, the shorter the period in the kilns. While in the curing rooms the pipe is subjected to live steam and a spray or mist from White shower nozzles. The use of these nozzles for keeping cement products damp during curing is rather a novel idea, but has proved very satisfactory in this installation.

An interesting feature of the plant is the tall cement smoke stack, which was erected by the company. This stack was poured by using pipe molds all the way to the top, so that no other forms were necessary.

Handling Pipe in the Storage Yard

Many of the most noteworthy features of the plant are found in the handling of the pipe in the yard. This yard is a half-mile long strip bounded by the main track to the sand plant on the west and by another switch track to the east. It contains rows and piles of pipe in seemingly endless quantities. In handling this quantity of pipe, the company has found that Fordson tractors have been the most serviceable. At present there are three Fordsons with hard rubber tires used in the yard in conjunction with three Warner trailers. The latter are two-wheeled and have a capacity of three tons. These outfits are used to move the smaller size pipe. The larger pipe are transported by one of the cranes or are rolled by another Fordson tractor which has been fitted with crawler treads made by the Belle City Manufacturing Co., Racine, Wis. A small flexible roller has been fitted to the front of this caterpillar tractor and the larger size pipe are pushed along with this. This method has proved very successful and is less expensive than any other system of handling.



Plant and kilns for the construction of large size pipe

Production and Distribution

The Illinois-Wisconsin company operates its plant summer and winter without much difference in the amount of pipe turned out. In summer the plant employs approximately 50 men, while in winter the total is 40, or a few less. The winter production is practically all small sizes, since the small sizes take up much less room for storage. In summer the plant gets out mostly large size pipe, but these are usually shipped immediately. The average daily production runs about 60 tons for larger sizes, or a like figure for the small sizes.

The company ships quite a bit of its product by rail, via the Chicago & Northwestern, which runs near the plant. The switch track past the products plant and down to the sand plant is owned by the C. & N. W. Much of the balance of the pipe is sent out by trucks, but now some of it is being taken into Beloit by tractor. This can be done very well when one or more of the tractors has no other work at the time. The market for the company is limited to a circle of about a radius of 150 miles from Beloit. This includes the city of Chicago, and the company now has its general offices in that city. It also maintains sales offices in Milwaukee and Beloit.

Atwood-Davis Sand Plant

While the Atwood-Davis company and the Illinois-Wisconsin Concrete Pipe Co. are not actually connected, the relationships between the two are so close that it would be

Type of large pipe built for sewers and culverts

Loading pipe with a crane fitted with special hook

hard to consider one and not the other. After the Atwood-Davis company finished with its original pit, and the products company leased the property, the gravel company turned to a second pit on the other side of the C. & N. W. R. R. from the plant, but not at a great distance. An underpass for the pit cars was constructed, and the pit was opened on a large scale. This time the gravel company is trying a new experiment in making use of its old pit for a portion of this second pit is now being subdivided and it is expected that it will soon be improved.

In stripping, a Koehring shovel with a 1¼-yd. bucket is used. The overburden averages from 2 to 4 ft. thick. The dirt is dumped by the shovel into a hopper attached to a portable conveyor, and the conveyor carries it across the pit track and dumps it in the open pit. A Browning 2½-yd. shovel is used in the pit to fill the hopper bottom cars. The cars are drawn by a dinkey made by the Davenport company. At the present time there is a face some 600 yds. long from which the company is removing gravel.

The cars are dumped into a hopper at the plant and the gravel is taken by a 30-in. conveyor belt up to a scalping screen in the crushing house. Here the fines pass on to a 30-in belt conveyor and up to the washing plant, while the rejects of the screen go to two Gates gyratory crushers below the screen. Each crusher is driven by a 20-hp. General Electric Co. motor. Passing through the crusher the discharge is carried up to the screen again by a bucket elevator. The material at the washing plant is carefully washed and graded. It goes first to two revolving conical screens, and then passes on to three more conical screens. After these it passes through another group of three screens for further sizing. The discharge of these screens goes on to a battery of three Hummer vibrating screens and from there it passes to a second battery of three Hummer screens. The bins beneath the screens are conveniently arranged for loading both railroad cars and trucks.

A. S. Sorenson is president of the Illinois-Wisconsin company; W. C. Whitcomb, secretary and treasurer. For the Atwood-Davis company, Mr. Whitcomb is the president and Mr. Sorensen is the secretary and treasurer. M. D. Corcoran is the superintendent of the pipe company's plant.

New Cement Products Company Starts Operating in Minnesota

A NEWCOMER in the cement products industry is the Builders Supply and Construction Co. of Bemidji, Minn., which was recently incorporated for $50,000. The new company has purchased the entire property of the Bemidji Concrete Manufacturing Co., which was recently dissolved by its stockholders. The Builders Supply company is contemplating the expenditure of more than $25,000 in the near future at its plant west of Wymore, Minn., and expects to expand its business in the concrete products line and also to start dealing in other building materials as well. The incorporators of the company are John Goodman, Nels Loitved, M. A. Rognlien and E. R. Jahr. Mr. Jahr is manager of the new concern.

Bond Between Concrete and Hollow Tile

AN investigation of the bond between concrete and hollow tile has just been completed. The factors covered by the tests included six different types of hollow tile and concrete mixtures of several consistencies and proportions. The tiles used in making the specimens were in a dry, saturated, or in a semi-saturated condition. The specimens were cured either in dry or in damp storage. All specimens were tested when 28 days old, the damp-storage specimens being allowed to dry out 14 days prior to testing. Concrete control cylinders 6x12 in. were made from the same batches as the concrete in each bond specimen.

The test specimens represented sections from a hollow tile concrete floor, each made up of two tiles joined by a concrete block 4 in. in thickness. The testing consisted in loading the concrete blocks by a heavy bearing block, the tiles forming the lower base. The desire was to obtain a shearing failure between the concrete. The results obtained indicate that the bond depends largely on the strength of the concrete, but this relation may be disturbed by using saturated tiles or damp curing. The condition least favorable to a good bond was found to exist when specimens were made from saturated tiles and then cured damp. This particular tile had an absorption of about 10%. In general, damp curing did not increase the bond strength.

Specific factors which affected the bond strength were:

1. Strength of the concrete, the stronger the concrete the greater the bond.

2. Absorption of the tile, no general law being observable.

3. Amount of water in the tile, the greatest bond being developed by dry tile, slightly less by sprinkled tile, and the least bond by saturated tile. For tiles of the lowest absorption, about 3.1%, there was no material strength difference in bond, whereas the greatest bond difference was recorded for the tile with 5+% absorption. The absorption ranged up to 21+%.

4. Curing conditions. The dry-cured specimens developed a slightly higher average strength than the damp-cured.

As a practical guide in construction, based on the results of these tests, it is recommended that the hollow tiles be sprinkled only enough to work off the dust and loose particles, and that concrete contain the minimum amount of mixing water necessary for proper placement.—*Technical News Bulletin.*

New Concrete Pipe Plant for Pine Bluff, Arkansas

WITH a program for the expenditure of about $50,000, work is starting on the construction of the new plant which the Hollywood Concrete Products Co. is establishing in Pine Bluff, Ark. This company is a subsidiary of the Choctaw Culvert and Machinery Co. of Memphis, Tenn., and it also has its main offices at Memphis. O. H. Miller is president of both companies.

The latest type McCracken patented machinery will be installed in the Pine Bluff plant. Storm and sanitary sewer pipe, 6- to 24-in. in diameter and reinforced concrete pipe, 15- to 36-in. in diameter, for highway culverts, will be manufactured.

Oliver Galbraith, who has been for the last year the Arkansas representative of the Memphis offices, will have charge of the sales of the local office. He also will continue as state representative. H. E. Johnson, general superintendent of the Hollywood Concrete Pipe Co. plant at Memphis, will be superintendent of the new plant.

Wisconsin Concrete Products Men to Meet

THE sixth annual meeting of the Wisconsin Concrete Products Association is to be held on February 2 and 3 at the Hotel Schroeder in Milwaukee, and the program promises to be even more interesting than have been the ones at past meetings. The main feature of the convention will be the papers on cost data presented by E. E. Sheasgreen of the Standard Cost Finding Service Co., Minneapolis. At the opening session he will present a talk on "The Science of Square Dealing."

In the afternoon meeting on Thursday there will be a business meeting and a number of 10-minute papers on operating problems presented by members of the association, which should prove well worth while. W. D. M. Allan, manager of the cement products bureau of the Portland Cement Association, will deliver a paper on "Concrete Products," followed by a second paper by Mr. Sheasgreen on "Cost Finding Data." In the evening will be the banquet with L. S. Brodd, district engineer for the Portland Cement Association, as toastmaster.

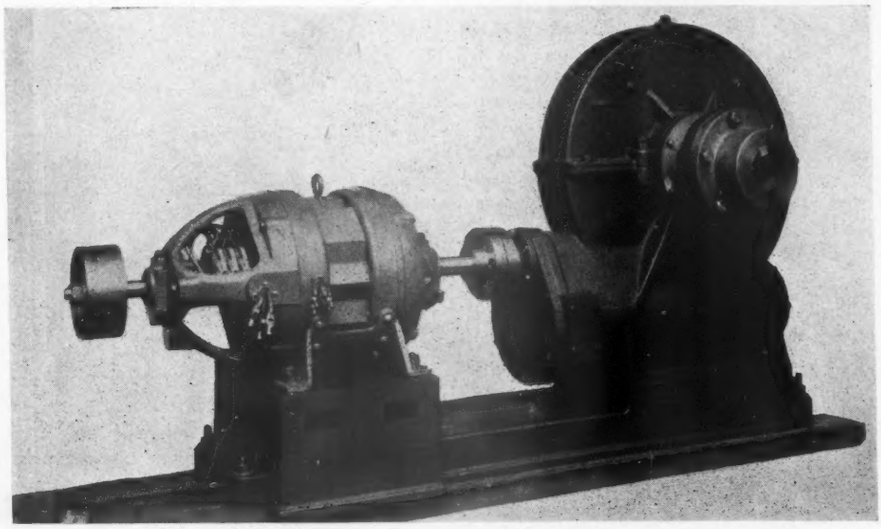
On Friday morning, Jack Franklin of the Consolidated Concrete Machinery Co., Milwaukee, will speak on plant equipment, and Mr. Sheasgreen will continue his discourse on "Cost Finding Data." In the afternoon a very promising paper on "Planned Advertising" will be presented by Bert Wheeler, advertising manager of the Marquette Cement Co. The program will be concluded by a round table discussion. It is announced that the Iowa Concrete Products Association intends to send a good-sized delegation to the Wisconsin convention, and it is also reported that producers from Minnesota, North and South Dakota will be there.

New Machinery and Equipment

New Worm Gear Speed Reducer

THE FAWCUS MACHINE CO., Pittsburgh, Penn., has recently placed on the market a new type of worm reduction gear especially designed to give high ratios of speed reduction with better efficiency characteristics. The units comprising the complete line, which is known under the type designation of WTH, have been built in three sizes, Nos. 5, 6 and 7, with capacities of 15-, 20- and 35-hp., with corresponding ratios of 98:1; 190:1 and 160:1, respectively. The actual speeds of the different units are said to be 900/4.4 r.p.m., 1150/6 r.p.m. and 1150/7.2 r.p.m. The units, according to the manufacturers, have a common efficiency of about 75% under the above load conditions and are suitable for any sort of slow speed, heavy duty application that comes within the limit of their horsepower range.

The essentials in design and construction are uniform throughout the whole line, being substantially as follows: The driving motor is connected by means of a flexible coupling to a helical pinion which drives a helical gear mounted on an extension of the worm shaft. This gear drives the worm, which in turn drives the worm wheel. By this interposing the helical gear train between the motor and the worm shaft it is said to be possible to hold the tooth angle on the latter within the limits of good efficiency and still obtain a high reduction ratio. Another feature is that all the various shafts are mounted in Timken bearings. The helical pinion shaft mounting comprises two bearings, one at each end of the shaft, and the same arrangement is used for the worm wheel. The worm shaft is mounted on two steep angle bearings, one located at the end opposite to the helical gear, and the other between the worm screw and the gear. Both gears and bearings are self lubricated from the oil reservoir in the bottom of the case.



Worm gear speed reducer designed to give high reduction ratios

New Electric Hoist

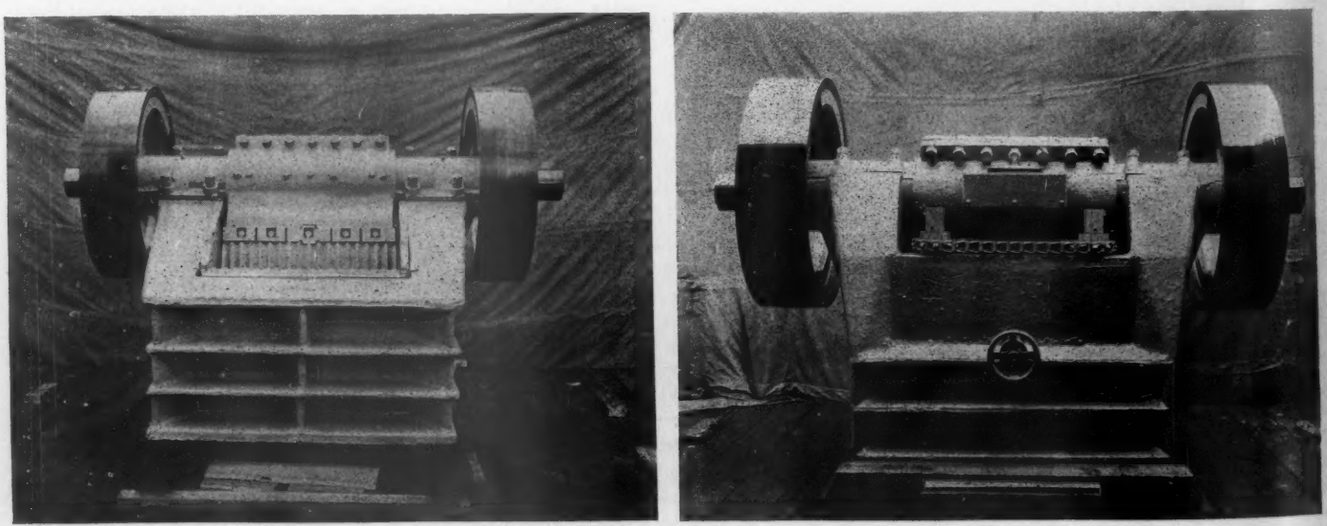
THE American Engineering Co., Philadelphia, Penn., announces the "Quick-Lift," a moderate priced, all-steel, ¼-ton electric hoist.

This is a high speed hoist with pressed steel frame, chrome-manganese steel in gears and shafts, ball bearings, non-spinning hoisting rope, oil bath lubrication, push-button control and upper and lower limit switches. All working parts are fully enclosed.

The hoist weighs 200 lb. and is made in two types—plain trolley and hook suspension. The plain trolley type requires 16-in. headroom and the hook suspension type 18-in.

New Heavy Duty Jaw Crusher

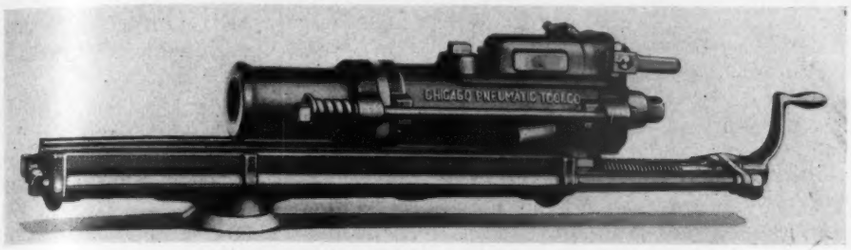
THE Iowa Manufacturing Co., Cedar Rapids, Iowa, has added a new jaw crusher to its line. The new machine has a 14 x 36-in. opening and is built to withstand severe service. Though it can handle large sized stone, its weight (21,000 lb.) is not excessive and the power requirements claimed to be in line with its performance.



Front and back views of new jaw crusher

New Drifter Drill for Hard Formations

WITH THE VIEW of developing a more powerful machine than its 118-lb. one-man CP-5 drifter for heavy tunnel work, deep holes and exceptionally hard formations, the Chicago Pneumatic Tool Co., New York, perfected within the past year its CP-6 drifter. This new drill is built along similar lines to the CP-5, retaining the general operation characteristics but with larger bore. The machine is claimed to strike hard, rapid blows and to have the necessary speed and durability to cope with the severest drilling conditions. Its weight is given as 136 lb. and it is said to have been used successfully by several companies as a one-man machine.



New drifter drill for hard drilling

New Single Roller Bearing for Kilns, Coolers and Dryers

A NEW DESIGN of single roller bearings for medium sized dryers, coolers up to large size rotary kilns, is announced by the Vulcan Iron Works, Wilkes-Barre, Penn. The particular features claimed for the new bearing are self-lubrication and self-alignment. The lubrication system, shown in one of the accompanying illustrations, comprises a pocketed wheel which dips into a water-cooled oil cellar and carries the oil to the top of the bearing, where it is distributed over the entire length of the bearing and also the thrust discs which take the end thrust imposed on the bearing. The thrust discs are of high-grade hardened tool steel.

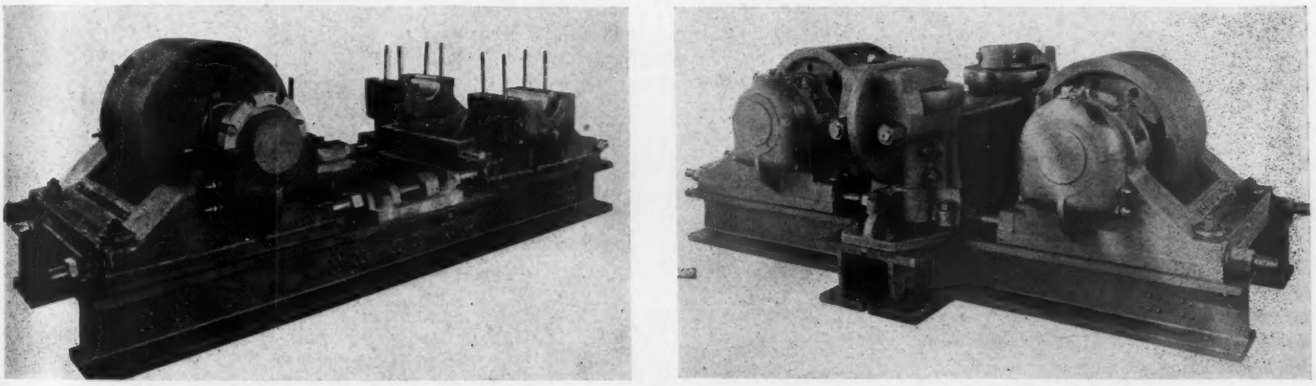
One of the other illustrations show the self-aligning feature claimed for the new bearing. With reference to this cut, the lower half of the ball fits into a socket in both the pedestal base and cap, thus taking care of shaft deflection and mis-alignment, the manufacturer says. Likewise, the thrust discs are also made with a ball and socket face to compensate for deflection or mis-alignment.

All the bearings are ruggedly constructed and offer advantages of operation, according to the manufacturers.

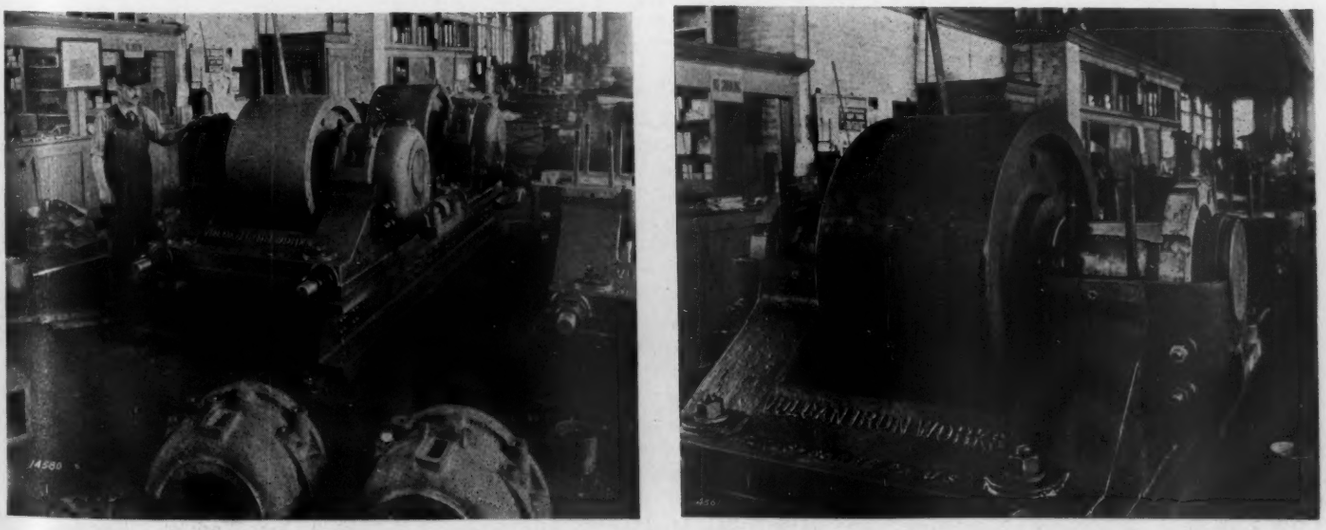
Heavy Current Electrode Holder

A NEW 600-ampere metal electrode holder is announced by the Lincoln Electric Co., Cleveland, Ohio. This holder handles metal electrode in sizes up to ½ in. diameter and is known as type TR.

Many improvements are claimed for the holder, among them being replaceable copper jaws, four line contact for the electrode, all copper path for welding current, structural steel construction (maximum strength), light weight with good balance, cool insulated and ventilated handle and shield for protection of the operator's hand.



New single roller bearing for rotary kilns or coolers showing the features of the lubrication system



Illustrating the rugged construction and size of the roller bearing and (right) details of the self-alignment feature

Large British Cement and Lime Company Formed

UNDER the title of Portland Cement and Limestone Products, Ltd., a new undertaking has just been organized in England with a capital of £500,000 ($2,500,000). The company has been formed to acquire three properties—at Pitstone, near Tring; at Leighton Buzzard, and at Coleford in Gloucestershire.

The principal works will be at Pitstone, where the acquisition consists of a 99 years' lease of 242 acres of land, with the right to work the chalk and marl thereon under a favorable royalty plan. The land is adjacent to the main line of the London, Midland & Scottish Railway, has long frontages on important main roads, and contains practically inexhaustible deposits of chalk and marl suitable for the manufacture of high-grade portland cement and lime. There are fine sites for works and sidings, and the Grand Junction Canal is only a few hundred yards distant. Thus the transport facilities consist of railroad, canal and main road. The surface rent payable under the lease is £700 ($3,500) per annum, including the works' site and building frontages. The minimum royalty rent is £650 ($3,250), which merges into a royalty of only 12 cents per ton of lime or cement when sufficient quantities are produced. Six mixed-feed lime kilns will be erected having a combined capacity of 150 to 180 tons per day, and also a hydrating plant and a grinding and bagging plant will be built. It is expected that the first unit, consisting of two kilns, will be completed and running within seven months from the starting of work, and the remainder will be finished about ten weeks later. While this work is in progress, the construction of the foundations, sidings and rail connections for the cement plant will also be carried on, and as early as possible the construction of a modern portland cement factory will be commenced. The plant will have an annual capacity of 110,000 tons and will cost approximately £100,000 ($500,000).

The Leighton Buzzard property consists of the freehold of a block of brick buildings standing upon 1¾ acres of land adjacent to the L. M. & S. Railway, to which sidings are already laid and connected. Coupled with the purchase is a contract for the supply of sand of proved suitability for the manufacture of superior sand-lime bricks. A modern plant will be erected having an output capacity of 60,000 sand-lime bricks per day. The plant will be completed and in operation within four months of the date of starting work.

At Coleford, the Whitecliff quarries, 42 acres in extent, have been acquired. They contain large deposits of mountain limestone and have works, sidings and railway cars. The working face of the quarry forms a cliff about 85 ft. high, with a shallow overburden a few inches thick. These physical conditions render working and development both easy and cheap. As a road stone, the material is admirably suited for the application of bituminous material, or when calcined it produces excellent building lime. The main road skirts the property and the Great Western Railway lies at the foot of the quarry, so that the finished product can be economically dispatched by road or rail. Two existing lime kilns, having a capacity of 150 tons per week, and a grinding and bagging plant are ready for immediate output. These works will be extended by the construction of further kilns to bring the output capacity up to 1200 tons of lime per week, and by the erection, within about four months, of a modern stone crushing plant having a daily capacity of 200 tons.

Great Lakes Shipments of Limestone in 1927 Break All Records

THE total net tonnage of coarse freight movement on the Great Lakes for 1927 reached the third highest peak in the history of lake shipping, according to the annual report of the Lake Carriers Association.

The data, gathered from authentic sources, show that 120,760,195 net tons constitutes the total amount of commodities carried. Although there is a loss of 529,307 net tons from the highwater mark established in 1926, it is only 268,909 net tons short of the previous high record made in 1923.

The big boost in both 1926 and 1923 was due to the high movement of iron ore. On the other hand, the total tonnage this year was given impetus from the bituminous coal, limestone and grain shipments which practically absorbed the loss in the iron ore movement.

Limestone shattered all previous records in the history of the lakes during the past season when 14,033,376 net tons were shipped against 12,628,244 net tons for 1926, the previous high mark.—*Cleveland* (Ohio) *Plain Dealer.*

Use of Foreign Cement Prohibited on Miami Streets

USE of foreign cement in the construction of streets in Miami, Fla., has been prohibited by the Miami city commission until the imported cement can satisfactorily pass a 28-day strength test. Welton A. Snow, city manager, informed the commission that the last test of foreign cement after a 28-day test showed it to be 1.8% below standard, although the 7-day test showed conformity. It was the opinion of commissioners that a thorough local test of cements was important and that conformity with foreign standards should not be deemed sufficient.—*Miami* (Fla.) *Herald.*

Demand for Lake Sand in the Chicago Area Is Good in 1927

LAKE sand producers in the Chicago district experienced a year of heavy production and sales, although in volume business was not quite as active as it was in 1926 through the entire twelve months. A dull period developed during the midsummer season, but demand picked up in the third quarter and continued fairly active until the Christmas holidays.

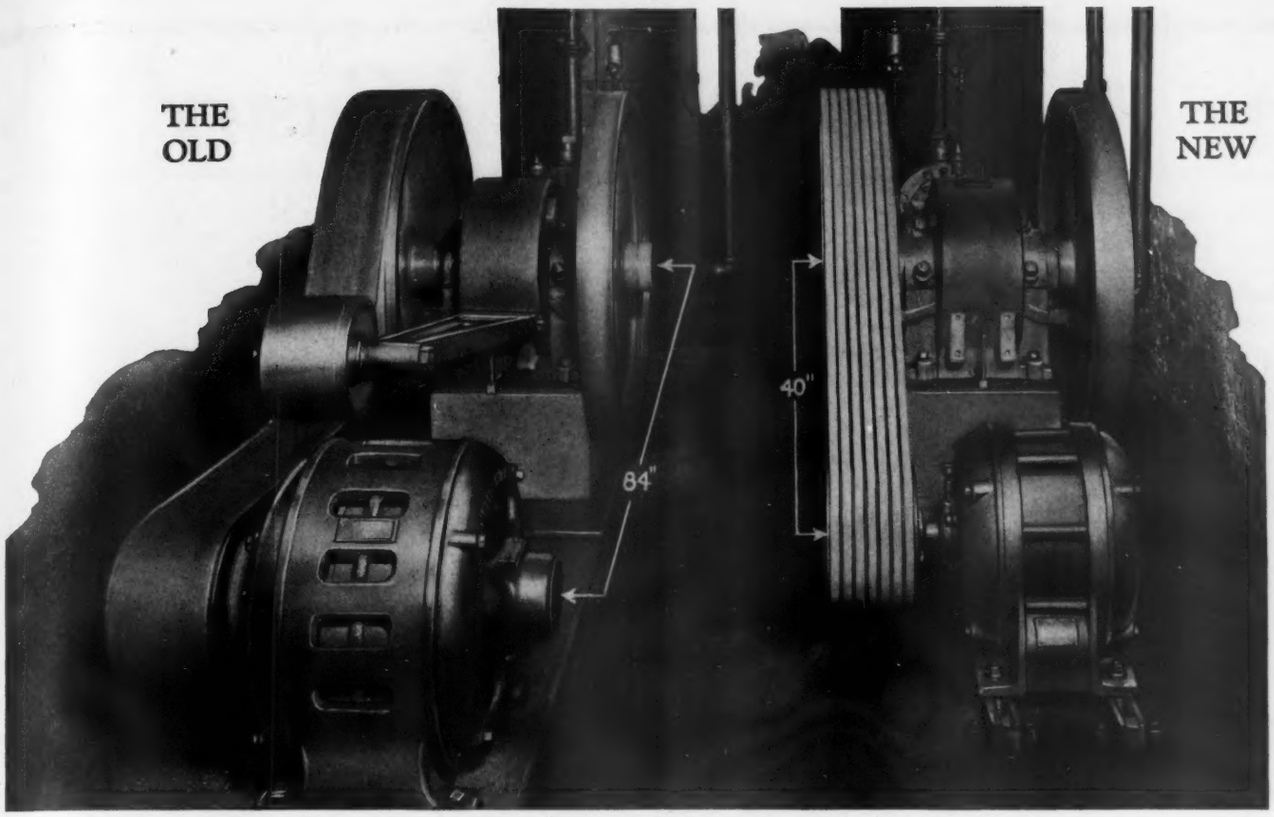
In this industry an outstanding feature reported by some of the producers was that the 1927 demand from the asphalt pavers was heavier than it was in 1926. The falling off in volume, while not great, was attributed to some slowing down in the building lines. It was a year of fairly steady prices for lake sand, particularly during the first half, with a slightly lower market during the last six months.

The outlook is bright for the first half of 1928 and the producers are basing their optimism for a heavy and active demand on permits which indicate a large building program, the plans for street and alley paving, and many other construction activities. Stocks of lake sand at the dock yards are reported ample to meet the demand from the trade through the season of closed navigation.—*Chicago Journal of Commerce.*

Scotia Diatom Products Co. Developing Deposits in Nova Scotia

NEW BRUNSWICK and Nova Scotia are sorely in need of practical prospectors to develop their vast mineral resources, according to R. E. G. Burroughs of Little River, N. S., general manager of the Scotia Diatom Products, Ltd., who is seeking the development of large deposits of diatomaceous earth near Little River. Mr. Burroughs stated that three factors have been responsible for the tardy exploitation of mines in the two provinces, namely, improper mining laws, inadequate financing, and the lack of technical advisors to discern the mineral wealth. The mining laws have been changed and now have in them a clause which compels the owners of mines to work their property. Financing has been improved and it now only remains to obtain the technically trained men.

Mr. Burroughs recently purchased the machinery of the Stephens Brick Co. of St. John, New Brunswick, for about $75,000, and it is to be shipped to the Scotia company's plant at Little River, where it is to be installed. The company has recently located a large deposit of diatomaceous earth and expects to spend $225,000 in the development of it. The greatest advantage of the new deposit is its nearness to the sea, so that the product can be easily loaded on ships and taken to New York at a low figure.—*St. John* (N. B.) *Telegraph-Journal.*



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Duplicate Compressors, operating at same capacity and pressure.

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The 40" pulley centers on the new unit is less than one-half of this dimension on the flat belt driven unit.

The short belt centers made possible by Texrope Drive and the compactness of the Allis-Chalmers motor with Timken Bearings result in a big saving in floor space.

The Texrope requires no lubrication; dust does not affect it. The motor is made largely of steel—indestructible rotor—extra sealed insulation—grease packed bearings which require attention only a few times yearly. These features reduce maintenance to a negligible item.

ALLIS-CHALMERS MANUFACTURING CO.
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A Combination Unequalled!

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News of All the Industry

Incorporations

Bellina Sand and Stone Co., Syracuse, N. Y.

Adamant Stone Quarry Co., Miami, Fla., $10,000. J. S. Winterringer, Jack Brant and A. Brant.

Tumalo Sand and Gravel Co., Bend, Ore., $10,000. B. L. Mitts, George G. Martin and W. F. Guernsey.

Williford Crushed Stone Co., Memphis, Tenn., $50,000. W. W. Fisher, W. N. Fry and L. T. McCourt.

R. & E. Concreting Co., Inc., Union City, N. J., 500 shares common stock; to manufacture concrete products.

Great Lakes Portland Cement Corp., Indianapolis, Ind., filed papers increasing its capital stock to 85,000 shares no par value.

Ozaukee Sand and Gravel Co., Milwaukee, Wis., 1000 shares at $100 each. Henry Ripple, Alois Meenecke and Frank Ripple.

Apex Sand and Gravel Co., Denver, Colo. $20,000. N. Lindblad, B. E. Carleno, and E. C. Armstrong.

Nelson Stone Equipment Co., Kansas City, Mo., $10,000. To manufacture building blocks. John M. Cleary, Scarritt Bldg., Kansas City, A. E. Long.

Mission Lime Products Corp., Los Angeles, Calif., $100,000. Louis Schirm, Sr.; Louis Schirm, Jr.; John S. Schirm, R. J. Schirm and E. H. Rumer.

Concrete Tile and Roofing Co., Montgomery, Ala., $25,000. A. C. Luhn, president; J. L. White, vice-president and treasurer, and F. E. Dyer, secretary.

Duntile and Concrete Products Co., Crystal Lake, Ill., $30,000. To manufacture and deal in concrete tile known as "Duntile." Edward E. Bossey, Elof Bandstrom and Max Kisbel.

N. & B. Crushed Stone and Gravel Co., Inc., New Bedford, $50,000, 500 shares, $100 each. President, Henry Boudreau; treasurer, Josephat Nault, 232 Shaw St., New Bedford, and Rolland Boudreau.

Jayhawk Sand-Gravel Co., Topeka, Kan., $20,000 in preferred stock and 10,000 shares common stock with no par value. E. G. Saunders, Howard Yingling, R. A. Keefover, J. E. Yingling and C. E. Garlinghouse, all of Topeka.

Utah Rock Asphalt Co., Pueblo, Colo. $1,000,000. C. N. Power, Ben Bergerman, Andrew McGovern, Jr., John Cregan and Dr. Herbert Black, all of Pueblo. The company has holdings 30 miles east of Price, Utah, about two miles in length, with deposits to a depth of 400 ft.

Quarries

Garlinghouse Brothers, Lewiston, Idaho, have purchased the Snake River Granite Quarry on Corral Creek for $10,000.

Limestone Products Corp., Newton, N. J., has recently purchased a 10-ton crawler-tread steam shovel.

Lexington, Va. The district road board has purchased a quarry a mile southeast of Lexington, comprising 4¼ acres of land.

Marble Mountain Co., Los Angeles, Calif., which leased the crushed marble quarry of the Jordan Marble Co., of San Antonio, located at Alpine, Tex., is installing new machinery and equipment at the quarry.

Croton, Iowa. The state of Iowa has purchased a large tract of land at Croton and will develop it with a large stone quarry, according to reports. It is believed that convict labor may be used in the new quarry.

Hayden Anderson, Fayetteville, Ark., has leased the limestone quarry of the Ozark White Lime Co. at Gulley, Ark., and will install a new crushing plant at the quarry to produce stone for road work and building. The plant is to be in operation in March, and will have a capacity of 200 to 400 yd. daily.

France Stone Co., Toledo, Ohio. Natcher R. France, president of the France Stone Co., has acquired title to the stone quarry property of John F. Wolf in Reed county, Ohio. The property contains 6.57 acres of land and gives the France interests control of another valuable holding in that part of the state.

Sand and Gravel

Livingston Sand and Gravel Co., Livingston, N. J., has purchased a 10-ton crawler-tread locomotive crane.

Pioneer Sand and Gravel Co., Horton, Mont., has begun the construction of a $70,000 gravel washing plant.

Ralph Bausman, of Piqua, Ohio, has started the construction of a $50,000 gravel plant at Troy, Ohio, on a 60-acre tract of land leased from Mrs. M. Gabriel of Troy.

Copiah Gravel Co., Crystal Springs, Miss., recently incorporated for $200,000, is preparing to start operations early this year. E. R. Owens is president of the company, W. B. Wingfield is vice-president, and L. M. Dampeer is secretary and treasurer.

Cement

Dewey Portland Cement Co., Kansas City, Mo., distributed $21,000 in bonus payments to its employes at its Oklahoma plant on the 21st anniversary of the company recently.

Georgia Cement and Stone Co., Birmingham, Ala., is making extensive improvements at its mill at Portland, Ala., including the construction of a 1000-ton stone plant, together with alterations to its old plant.

Manitowoc Portland Cement Co., Manitowoc, Wis., is making several changes in its finish grinding department. New machinery is being installed, including a "Norblo" dust collecting system. The changes will be completed within a few weeks.

Aalborg Portland Cement Works, Jutland, Denmark, is arranging for an increase in capital to 4,800,000 kroner (about $1,250,000). A portion of the fund is to be used for expansion and improvements.

Dr. C. H. Richardson, assistant geologist of the state of Kentucky, in a recently published survey of the state, stated that there is an abundance of undeveloped raw material for the manufacture of cement within Kentucky.

Colorado Portland Cement Co., Denver, Colo., has opened its new plant at Boettcher, Colo., and on January 17 invited many prominent people of Denver to inspect the new mill. Transportation to Boettcher was furnished by the company, and a luncheon was served at the plant.

Lawrence Portland Cement Co. is planning the installation of a Fairbanks-Morse special electric style "VA" 360-hp. Diesel engine at its new Thomaston, Me., cement mill. The engine will serve as an auxiliary to electric service obtained from high tension lines.

Universal Portland Cement Co., Chicago, Ill., received 1,223,000 tons of limestone during 1927 at its new harbor and storage stock at Buffington, Ind. One hundred and nine freighters brought the stone. The Buffington harbor was completed in the spring of 1927, and the first ship docked there on May 5.

Guernsey, Wyo. The Chamber of Commerce of Gurnsey states that they believe that city is an ideal location for a cement plant, and they would like to have a plant located there. There is sufficient raw materials, power can be obtained from a government hydro-electric plant, coal is near by, and the railroad connections are good, the report states.

Cement Products

W. V. Struble, Portland, Ore., has taken over the merchandise stock of the Builders' Concrete Specialties Co. of Portland.

Edward S. Nicholas, Lanark, Ill., has obtained a patent on a mold for concrete building, the patent being allowed for improvements made.

Delphos, Ohio. Wm. A. Wagner, of Delphos, has organized a new company for the manufacture of cement blocks. At present the company is operating in space taken in the plant of the Horine Lumber Co., of Delphos.

Luther J. Johnson, St. Louis, Mo., has plans for starting a cement brick plant in St. Charles, Mo. Machinery is already being manufactured for the new plant and it is expected that it will be in operation by spring.

Lloyd Smith, of Fergus Falls, Minn., is planning to build a fireproof factory in Minneapolis for the manufacture of concrete block. The factory will be completed within a few months and is expected to cost about $20,000.

Kansas City Duntile Co., Kansas City, Mo., manufacturer of cast stone building blocks, recently purchased a half acre of land adjoining its present holdings. The company plans to erect a new building on the property, which will be 40x90 ft. and will cost approximately $30,000.

Le Mar Pipe and Tile Co., Grand Rapids, Mich., has purchased the cement pipe division of the Consolidated Coal Co. of Saginaw, Mich. The new owners will continue to manufacture the same type of pipe as did the Consolidated company, which started its pipe division 20 years ago. It is reported that the price paid for the pipe plant was $40,000.

Silica Sand

Winchester Glass Sand Corp., Richmond, N. Y., is reported to be about to reopen its plant, which has been idle since the death of W. B. Crowell, president of the corporation, a year ago. New York and Pennsylvania capitalists have formed a syndicate to take over the property, which will commence operation with an output of 10 or 12 carloads daily.

Lime

Stark Grey Lime Co., Canton, Ohio, sustained a fire loss recently which destroyed a one-story frame shade but did little other damage.

Western Lime Works, Ste. Genevieve, Mo., had a fire on December 31 in a coal bin at its plant, but no other damage was reported.

Longview Lime Works is removing four shaft kilns from its Longview, Ala., plant for re-erection at its Saginaw, Ala., plant. A complete Schulthess hydrate unit will be installed at the Saginaw plant by the McGann Manufacturing Co., York, Penn., who are also in charge of the removal and re-erection of the kilns at Saginaw.

Agricultural Limestone

Cerulean Stone Co., Cerulean, Ky., recently shipped a trainload of 17 cars of agricultural limestone for the use of Kentucky farmers. This is the first time a complete trainload of agstone has been received by farmers in Kentucky at one time.

Gypsum

Atlantic Gypsum Products Co., Boston, Mass., has awarded the general contract to Donnell-Zane Co., New York City, for the erection of a six-story plant at 150th St. and the East river, to cost nearly $75,000, including equipment.

Canada Cement Co., Ltd., Montreal, Canada, is planning to construct a dock and loading tower at Antigonish, Nova Scotia, to be used in connection with shipping gypsum to Chester, Penn.

Henry J. Schweim, engineer for the Gypsum Industries, Chicago, delivered an address on "The Adaptability of Gypsum in Building Construction" before the annual convention of the Building Material Dealers' Association of eastern Pennsylvania, in Philadelphia on January 19.

Miscellaneous Rock Products

Uvalde Rock Asphalt Co. is to install a new 360-hp. Fairbanks-Morse Diesel engine with direct connected alternator and exciter for operating its crushing plant at Cline, Texas.

More Yards per Dollar

With WESTEECO TEETH

THE modern power shovel is really a wonderful machine. Like the modern locomotive it is a thing to admire, to inspire confidence—a marvel to the mind of the average person and a tribute to mechanical genius. Mechanically, the present-day shovel is dependable and efficient.

But even so, every shovel to do its best work, must have the right kind of "support." The best sculptor in the world couldn't do justice to his actual ability with dull or inferior tools. The dipper teeth are the "tools" with which your shovel carves out its yardage. WESTEECO TEETH—under all operating conditions—make the going easier and stay on the job longer. They are harder, tougher, last longer, reverse faster—and ARE FORGEABLE. The total result is MORE YARDS PER DOLLAR!

WESTEECO PRODUCTS

V. G. Honstain, Patent
Manufactured exclusviely by
Western Crucible Steel Casting Co.

Write for circulars telling about many other advantages

Western Crucible Steel Casting Co.

2833 GRAND AVENUE **MINNEAPOLIS, MINN.**

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Pacific Asbestos and Supply Co., Portland, Ore., sustained a fire recently which damaged a considerable portion of its plant, the loss being estimated at $50,000. Plans are already under way for rebuilding the burned portion.

Midland County, Texas. Dr. V. A. Udden, Dr. E. H. Sellard and Dr. E. P. Schock, of the University of Texas, have reported that they have made a study of the potash deposits in Midland county and have found them excellent and in such quantity that the whole of the United States could be supplied from that county alone for the next 250 years.

Muldoon Fuller's Earth Corp., Houston, Tex., notice of incorporation of which was in the January 7 issue of ROCK PRODUCTS, is planning the installation of equipment for the development of deposits at Muldoon, Tex., where more than 500 acres have been secured. The initial plant, it is reported, will include mining equipment, a grinding mill, a drying plant, and conveying and sacking machinery.

Personals

Sheldon M. Hird, Cleveland, Ohio, representative for a number of machinery manufacturers, has been named local distributor for the General Excavating Co., of Marion, Ohio.

J. E. Zahn, secretary of the United States Portland Cement Co., Denver, Colo., will be one of the Denver representatives at the meeting of the United States Chamber of Commerce in Honolulu, in February.

James J. Dolan, Kenosha, Wis., recently resigned from his position with the Chicago, Milwaukee & North Shore R. R. to become manager of the Kenosha Sand and Gravel Co. at Kenosha.

H. F. T. Erben, assistant vice-president of the General Electric Co., retired on January 1, 1928, after more than 40 years of service with that company. At the time of his retirement he was also vice-chairman of the General Electric manufacturing committee.

P. C. Brooks, who has been connected with Fairbanks, Morse & Co., Chicago, for 29 years, was recently elected a vice-president of the company. Mr. Brooks is also president of the E. & T. Fairbanks Co., the scale manufacturing subsidiary of Fairbanks, Morse & Co.

William Henry Harrison, formerly senior mining engineer of the U. S. Bureau of Mines, and later senior valuation and appraisal engineer in the Engineering Division of the U. S. Bureau of Internal Revenue, has resigned his connections with the Treasury Department and returned to private practice as a consulting engineer, having opened offices in the National Press Building in Washington, D. C.

Obituaries

Edward McCrady, vice-president and general manager of McCrady Brothers Co., Braddock, Penn., died on December 8 in the Braddock General Hospital of pneumonia, following an operation. Mr. McCrady was a director of the American Gypsum Co., Port Clinton, Ohio, and also a director of the Rogers Sand Co. of Pittsburgh, Penn. At the time of his death he was president of the Associated Pennsylvania Contractors. He was 48 years old.

Manufacturers

Blair & Co., Chicago bankers, announce the removal of their offices from the Illinois Merchants Bank Bldg. to the Bankers Bldg.

Boiler Engineering Co., Newark, N. J., announces the acquisition of the Turner Baffle Wall, developed by T. G. Turner since 1914.

Foote Brothers Gear and Machine Co., Chicago, recently appointed S. W. Calhoun as southeastern district representative with offices at Asheville, N. C.

Hercules Motor Corp., Canton, Ohio, recently announced an increased dividend of 33⅓% over 1926 and 100% over 1925, following the annual stockholders' meeting of the company. The former directors were re-elected.

Leeds, Tozzer & Co., Inc., New York City, announce the organization of that company as manufacturers' representatives for engineering machinery. Edward Leeds, president, was formerly vice-president of the Niles Bement Co. and European manager for the Brown Hoist Co. of Cleveland.

C. O. Bartlett & Snow Co., Cleveland, Ohio, anounces the appointment of William W. Dodge as its sales representative in western New York state. Mr. Dodge was formerly vice-president and manager of the Dodge Manufacturing Co. in the Chicago district. He will make his headquarters in Warsaw, N. Y.

Morrill & Morrill, New York City, American representatives for R. Wolf, Magdeburg, Germany, announce a new slurry filter for the cement industry. The R. Wolf people state that many different tests have been made which were very satisfactory. The output per square foot of filtering surface per hour was 55 to 65 lb. of cement cake, containing 20% of moisture, according to the reports.

General Electric Co., Schenectady, N. Y., has appointed B. L. Delach manager of the Schenectady plant. E. A. Wagner has been appointed manager of the Pittsfield, Mass., plant. In the sales organization, C. N. Gregory has been made manager of the New Haven office, and R. B. Ransom has been appointed resident agent in charge of the Hartford office, succeeding Mr. Gregory.

Beaumont Manufacturing Co., Philadelphia, Penn., announces the transfer of its former chief engineer, L. O. Hassler, to its western office at Chicago, where he will devote himself to sales in the Chicago territory. Wm. P. Alexander, who resigned from his position in the sales department in May, 1927, has returned to the organization and will be in the sales department in Philadelphia, Baltimore and Washington.

Gears and Forgings, Inc., Cleveland, Ohio, has been formed by the consolidation of the Van Dorn & Dutton Co., Cleveland; the Fawcus Machine Co., Pittsburgh; the William Ganschow Co., Chicago, and the Ohio Forge Co., Cleveland. F. W. Sinram, president of the Van Dorn & Dutton Co., has been chosen head of the new company; A. F. Cooke, of the Fawcus company is first vice-president; Wm. Ganschow is second vice-president; J. M. Clem, founder of the Ohio Forge Co., is third vice-president, and S. C. Dalbey, of the Ohio company, is secretary and treasurer of the new company.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has opened a new district sales office at Phoenix, Ariz., covering the states of Arizona, New Mexico and northern part of the Republic of Mexico. The office is located at 308 Heard Bldg., with J. B. Cooper as manager. Mr. Cooper's headquarters were formerly in Los Angeles. A branch office has been opened at San Antonio, Tex., with Earle R. Hury in charge. This is a branch of the district office at Dallas. A branch office is also being opened at Grand Rapids, Mich., Weiss Service Bldg., with G. C. Culver in charge. This is a branch of the Detroit district office.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Welding and Cutting Equipment. Illustrated catalog No. 28 on welding and cutting equipment. TORCHWELD EQUIPMENT CO., Chicago.

Baffle Walls. Illustrated bulletin showing typical installations and drawings of baffle walls. BOILER ENGINEERING CO., Newark, N. J.

Concrete Mixers. Illustrated bulletin on concrete mixers. BLYSTONE MANUFACTURING CO., Cambridge Springs, Penn.

Mining, Quarry and Gravel Pit Machinery. Illustrated bulletin showing types of crushers, screens and other equipment with data concerning each. SMITH ENGINEERING WORKS, Milwaukee, Wis.

Superheat Engineering Data. A supplement to the sixth edition of "Superheat Engineering Data" containing revised steam tables and other data included in the revised seventh edition, recently published. SUPERHEATER CO., New York City.

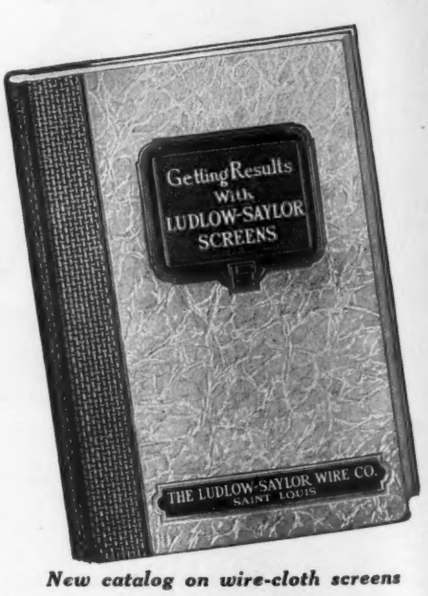
Large Engineering and Construction Company Organized

WHAT IS claimed to be the largest engineering and construction company in this country has been organized in Philadelphia, according to a statement issued recently by Arthur W. Thompson, president of the United Gas Improvement Co. "Four firms, widely known in this and other countries, have combined their interests and organized United Engineers and Constructors, Inc.," said Mr. Thompson. "These companies are the U. G. I. Contracting Co., Philadelphia; the Public Service Production Co., Newark; Dwight P. Robinson and Co., Inc., New York, and Day and Zimmerman Engineering and Construction Co., Philadelphia. Headquarters of the new company will be in Philadelphia, with offices in New York, Newark, Chicago, Los Angeles, Atlanta, Houston, Pittsburgh, Montreal, Buenos Aires and Rio de Janeiro."

Dwight P. Robinson is president of the company. The directors are Arthur W. Thompson, president, United Gas Improvement Co., chairman; Dwight P. Robinson; Thomas N. McCarter, president, Public Service Corporation of New Jersey; Samuel T. Bodine, chairman, board of directors, the United Gas Improvement Co.; Paul Thompson, vice-president, the United Gas Improvement Co., and president of the Philadelphia Gas Works Co., and John E. Zimmerman, president of Day and Zimmerman, Inc.

Attractive New Catalog on Wire Cloth Screens

THE NEW screen book just brought out by the Ludlow-Saylor Wire Co., St. Louis, Mo., is one of the most attractive pieces of manufacturer's literature to come to our attention. It is printed on special



New catalog on wire-cloth screens

colored paper stock and contains excellent illustrations of many of the vibrating screens, rotary screens, pulverizers and other screen-controlled equipment. The text has been divided into seven convenient sections, each of which is illustrated with types of screening equipment for particular use and the kind of screen cloth suitable for these machines. The data in all these sections appertains to the subjects illustrated.

The new 190-page compilation, "Getting Results with Ludlow-Saylor Screens" (Catalog No. 48), is offered free to all screen users and can be obtained on application to the Ludlow-Saylor Wire Co., St. Louis, Mo.

LUBRICATION IS POSITIVE IN HURON SPEED REDUCERS

A LUBRICATING system exclusive in design and remarkable in effectiveness is one feature of Huron Speed Reducers that stands out immediately in any comparison of speed reducer equipment.

The very nature of a speed reducer is such that proper lubrication at all points is something that cannot wisely be left to chance. To insure maximum service, lubrication, of all things—MUST BE POSITIVE. For this reason, Huron Reducers are fitted with a force-feed and bath system that insures a constant and uniform flow of cool oil to all bearings and other wearing surfaces.

Within the bridge wall of the housing is an oil compression reservoir to which the lubricant is delivered in a constant flow. A specially designed suction pump forces the oil from this reservoir to the main bearing from where it is carried through the shafting to points opposite all bearings and then through radial openings direct to the wearing surfaces. Furthermore, the bath from the gears furnishes oil to the bearings through holes provided for this purpose.

LUBRICATION IS POSITIVE — and that with less oil than is required for any other system.

THE HURON LINE

- Huron Speed Reducers
- Huron Gravity Seal Rings
- Huron Bulldog Shaft Couplings
- Conveyor Pulleys
- Conveying Machinery
- Special Foundry and Machine Work for the Cement, Lime, and Gypsum Industry.

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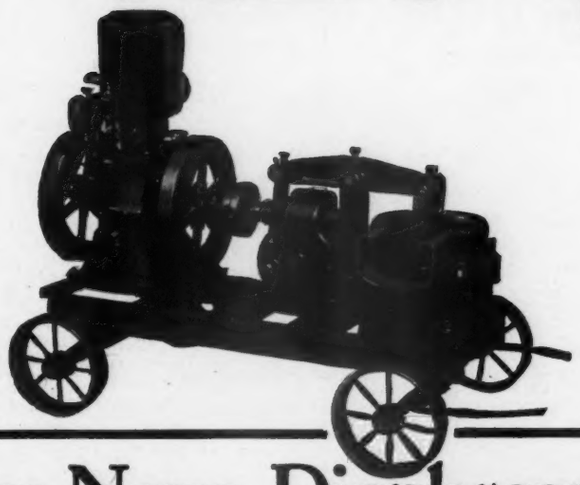
NEW



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Gruendler Patent Crusher & Pulverizer Co.
Hardinge Co.
Jeffrey Mfg. Co.
Kent Mill Co.
Polysius Corporation
Raymond Bros. Impact Pulv. Co.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 160

F. L. Smidth & Co.
Sturtevant Mill Co.
Universal Crusher Co.

Pumps (Air Lift)
Fuller Co.
Pennsylvania Pump & Compressor Co.
Sullivan Machinery Co.

Pumps (Cement Slurry)
American Manganese Steel Co.
The Dorr Co.
Fuller Co.
Polysius Corporation
F. L. Smidth & Co.
A. R. Wilfley & Sons

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bethlehem Steel Co.
De Laval Steam Turbine Co.
Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
Novo Engine Co.
Pennsylvania Pump & Compressor Co.
A. R. Wilfley & Sons

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Fuller Lehigh Co.

Pumps (Sand and Gravel)
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American Manganese Steel Co.
Hetherington & Berner, Inc.
A. R. Wilfley & Sons

Pumps (Self Measuring for All Liquids)
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Railway Equipment
General Electric Co.

Railways (Electric)
General Electric Co.

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Easton Car & Construction Co.
L. B. Foster Co.
Morrison Railway Supply Corp.

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General Refractories Co.

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Linde Air Products Co.
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Austin Manufacturing Co.
Caterpillar Tractor Co.
Harnischfeger Corp. (Pawling & Harnischfeger)
Koehring Co.
Smith Engineering Works
Universal Road Machinery Co.

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Traylor Eng. & Mfg. Co.

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Hyatt Roller Bearing Co.

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Stephens-Adamson Mfg. Co.

Sand Settling Tanks
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Stephens-Adamson Mfg. Co.
F. M. Welch Eng. Service.

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Scales (Cement)
Fairbanks, Morse & Co.

Scales (Truck & Railway Truck)
Fairbanks, Morse & Co.

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Hayward Co.
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Sauerman Bros.

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Austin Mfg. Co.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Cross Engineering Co.
Rubert M. Gay & Co. (Vibrating)
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Hardinge Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
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Jeffrey Mfg. Co.
Kent Mill Co.
Lewistown Fdy. & Machine Co.
Link-Belt Co.
Manganese Steel Forge Co.
McLanahan-Stone Mach. Co.
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Roberts & Schaefer Co.
Robins Conveying Belt Co.
John A. Roebling's Sons Co.
Simplicity Engineering Co.
Orville Simpson Co. (Gyrating)
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Traylor Eng. & Mfg. Co.
W. S. Tyler Co.
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F. M. Welch Eng. Service

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F. L. Smidth & Co.

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Harnischfeger Corp. (Pawling & Harnischfeger)
Hayward Co.
Industrial Brown Hoisting Machinery Co.
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Monighan Machine Co.
Owen Bucket Co.
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Silos
Burrell Eng. & Constr. Co.
F. L. Smidth & Co.

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Link-Belt Co.
Stephens-Adamson Mfg. Co.
F. M. Welch Eng. Service.

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De Laval Steam Turbine Co.
Horsburgh & Scott Co.
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R. D. Nuttall Co.
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Stephens-Adamson Mfg. Co.

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Chain Belt Co.
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Jeffrey Mfg. Co.
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Steel (Special Alloy)
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Haynes Stellite Co.

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H. K. Ferguson Co.

Steel Plate Construction
Hendrick Mfg. Co.
McGann Mfg. Co., Inc.

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Haynes Stellite Co.

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Sauerman Bros.

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Interstate Equipment Corp.

Transmission Belting
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co., Inc.

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Cleveland Worm & Gear Co.
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Kritzer Co.
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Tubing (Blasting)
B. F. Goodrich Rubber Co.

Turbines
De Laval Steam Turbine Co.

Turbo-Generators
De Laval Steam Turbine Co.

Turntables
Easton Car & Construction Co.

Underground Loaders
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Valves
Haynes Stellite Co.
Linde Air Products Co.
Merco Nordstrom Valve Co. (Lubricated Plug)
Prest-O-Lite Co.

Valves (Pump)
B. F. Goodrich Rubber Co.

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Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
The Dorr Co.
McLanahan-Stone Mach. Co.
Roberts & Schaefer Co.
F. L. Smidth & Co.
Smith Engineering Works
Stephens Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
F. M. Welch Eng. Service

Weighing Equipment
Fairbanks, Morse & Co.
Merrick Scale Mfg. Co. (Automatic Proportioning)
Schaffer Poidometer Co.

Welding and Cutting Apparatus
General Electric Co.
Haynes Stellite Co.
Linde Air Products Co.
Prest-O-Lite Co.

Welding Wire
John A. Roebling's Sons Co.

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Wheels (Car)
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Easton Car & Construction Co.
Fuller Lehigh Co.
Vulcan Iron Works

Winches and Capstans
Dobbie Foundry & Machine Co.
Mundy Sales Corp.
Novo Engine Co.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Manganese Steel Forge Co.
John A. Roebling's Sons Co.
W. S. Tyler Co.

Wire (Manganese Steel)
Manganese Steel Forge Co.

Wire (Welding)
Haynes Stellite Co.

Wire Rope
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.
John A. Roebling's Sons Co.

Wire Rope Fittings
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.
John A. Roebling's Sons Co.

Worm Gears (See Gears)

Built by Beaumont

Slackline Excavators

A Slackline Cableway Excavator has many advantages over other systems. A few of these are:

Entire operation of digging elevating and conveying is done by one machine, operated by one man. Plant investment is kept to a minimum, as well as payroll.

Only one machine is used, consisting of a few large, rugged units, which means that maintenance costs are low. There are fewer parts to get out of order.

Long range excavating is easily accomplished with a Slackline. Deep pits or underwater digging handled with equal facility.

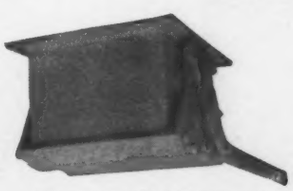
Cable Drag Scrapers

The Cable Drag Scraper is offered as the most economical solution of such jobs as stripping overburden, working bank deposits of sand, gravel, clay, etc. For stock piling it is without an equal, covering the entire area without having to make room for tracks. Thus every square foot of the storage area can be put to profitable use.

The Beaumont Scraper is designed for 100% shear cut and is of very rigid construction. Teeth are reversible and are of manganese steel. Cutting blade separate from main body of Scraper so as to be easily renewable.

Built in sizes from 1/3 to 4 yards.

Remember that one man — one machine does all the work up to the screens.



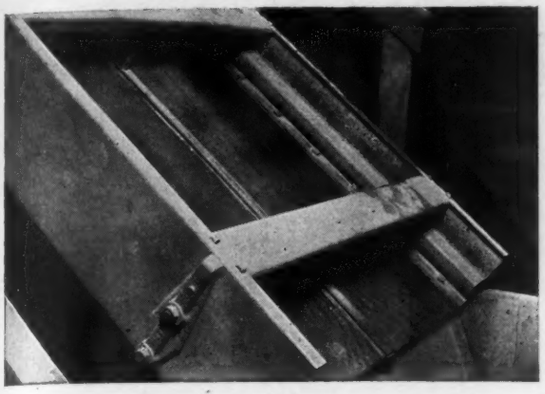
Beaumont Bin Gates— All Types and Sizes

Scraper outfits for either electric, gasoline, steam or belted operation.

Complete specifications and prices will be furnished on request

R·H· BEAUMONT CO.

313 Arch St., Philadelphia, Pa. **310 So. Michigan Ave., Chicago, Ill.**



What is Your Problem

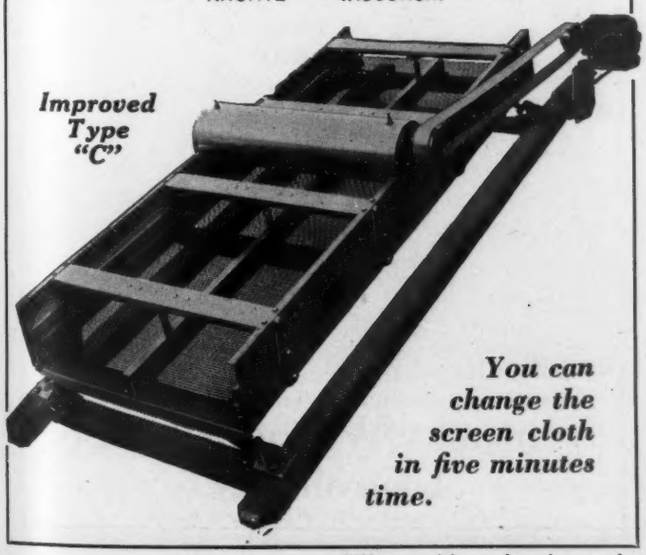
In Separating Your Finer Sizes of Material?

Our Engineers have had many years of experience through our specializing in this one line of endeavor, and we would be glad to aid you in solving any problems you may have in this connection, whether Vibrating Screens are required or not.

There is no charge for this service as we are here to be of service to you.

Just address your letter to Attention of: Engineering Dept.

UNIVERSAL VIBRATING SCREEN CO.
RACINE ~ ~ WISCONSIN



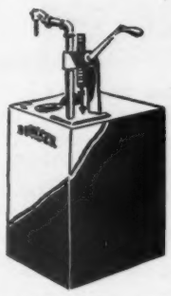
Improved Type "C"

You can change the screen cloth in five minutes time.

BOWSER

Encouraging Men to Use Enough Oil

Enclosed tank for departmental storage of oils



Small tank for storage of oils — can be used individually or in batteries

Larger tank — for engine room or central oil house garage

Put oil where it is **convenient,** and workmen use it adequately; make oil even a little bothersome to get at, and machinery suffers.

That's why Bowser has such a comprehensive line of equipment for departmental storage —square tanks, round tanks, hinged-top tanks, all with pumps mounted thereon. All sizes, of course—all leakproof, all accurate and all convenient to use.

Because we specialize on these oil storage problems, for all industry, we can engineer standard equipment to meet your individual needs, **at a considerable money saving.**

Let a Bowser man tell you how to put oil where it will be used —where it will **save** machinery as well as men's time. Address Dept. 75.

S. F. BOWSER & COMPANY, Inc.
LUBRICATION ENGINEERS AND MANUFACTURERS
FORT WAYNE, INDIANA, U.S.A.

LUBRICATORS-OIL FILTERS-OILING SYSTEMS-ACCESSORIES
OIL STORAGE AND DISTRIBUTION SYSTEMS

It is part of Rock Products' conception of its duty to readers and subscribers to help them in every possible and legitimate way. The "Situations Vacant" and "Situations Wanted" advertisements are a part of this service. The charges of 2 cents a word, or a minimum charge of a dollar per insertion, are nominal and not designed for profit. Numerous letters from these advertisers assure us of the effectiveness of these advertisements in finding capable men for openings and of finding openings for capable men.

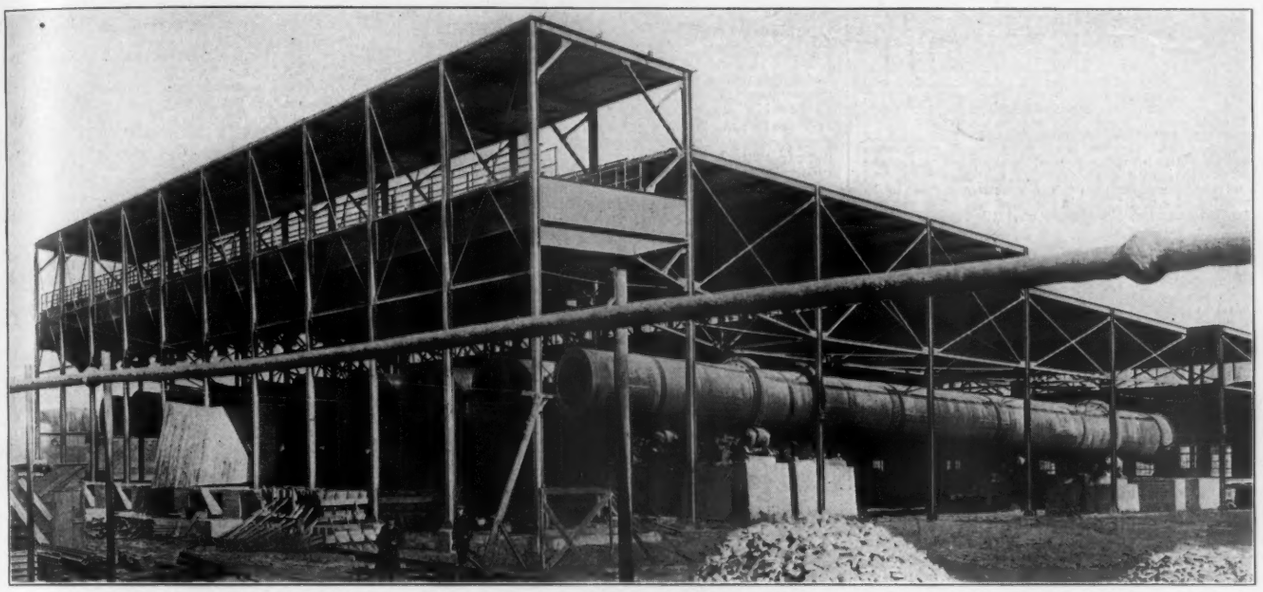
CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT
Two cents a word Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT



FOR SALE
TEN NEW 8′ 0″x125′ 0″ TWO TIRE VULCAN ROTARY KILNS
TEN NEW 5′ 0″x50′ 0″ ROTARY COOLERS
EQUIPMENT SALES COMPANY R. W. Storrs, Jr., Manager RICHMOND, VIRGINIA

MACHINERY FOR SALE

ROTARY CRUSHERS
Three No. 0, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, Three No. 0, One No. 1 Sturtevant Ring Roll Mill, One No. 2 Duplex Sturtevant Ring Roll Mill.

GYRATORY CRUSHERS
All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS
One 2″x6″, Two 7″x10″, Two 9″x15″, One 6″x20″, One 10″x15″, One 10″x20″, Two 12″x24″, One 13″x30″, One 15″x36″, One 18″x36″, One 24″x36″, One 22″x50″, One 36″x48″, One 40″x42″, One 60″x84″.

CRUSHING ROLLS
One 8″x6″, Two 16″x10″, Three 30″x10″, Two 36″x16″, Two 42″x16″, One 54″x24″, Two 14″x20″, and One 24″x12″ Crushing Rolls.

DRYERS
One 3′x20′, Three 4′x30′, One 5′x40′, Two 5½′x 40′, One 6′x60′, One 7′x60′, and Two 8′x80′ Direct Heat Rotary Dryers, One 5′x25′, One 6′x30′ Ruggles Coles type "A" and One 4′x 20′ Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6′x25′ Louisville Dryers.

KILNS
One 4′x40′, Two 6′x60′, Two 6′x90′, One 6′x 100′, One 6′x120′, One 7½′x80′, Three 8′x 125′.

HARDINGE MILLS
Two 3′, Three 4½′, Three 6′ and Two 8′ Hardinge Mills.

SWING HAMMER AND TUBE MILLS
Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

SPECIAL
One No. 8 Williams Universal Pulverizer.

THE HEINEKEN ENGINEERING CORP.
95 Liberty St. New York City
Telephone Hanover 2450

FOR SALE
STONE CRUSHING MACHINERY
PRICED FOR QUICK SALE

1—Set Sturtevant Balanced Rolls, 21x11 in.
1—Sturtevant Duplex Steel Jaw Crusher, 6x15 in
1—Kite Jaw Crusher, 7x16 in.
1—Sturtevant Jaw Crusher, 8x19 in.
1—Williams No. 2 Hammer Mill.
1—Sturtevant No. 2 Rotary Crusher.
1—Champion Jaw Crusher, 9x15 in.
1—Jeffrey Type A Hammer Mill, 30x24 in.
1—Allis-Chalmers Roll Crusher, 24x14 in.
3—6x4 in. Bucket Elevators, 30 ft. centers.
1—Sturtevant 3-Tier Moto Vibro Screen, Type MV with screw feed.
1—3x6 ft. Trommel Screen.
1—60 H.P. Locomotive Type Boiler, 100 lb. pressure.

Write, wire or phone your inquiries
CONSOLIDATED PRODUCTS CO., Inc.
15 Park Row, New York City Barclay 0603

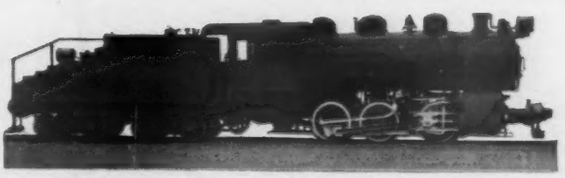
Machinery For Sale
Immediate Shipment—Attractive Prices

1—5′6″x50′ Renneberg Direct Heat Rotary Dryer.
2—7′x7′ Gates Ball Mills.
1—4′x16′ Smidth Tube Mill, brick lined.
1—No. 6D Gates Gyratory Crusher.
1—5′x22″ Hardinge Conical Mill.
1—24″x36″, Style D, Jeffrey Hammer Mill.
3—Sets 20x14″ Sturtevant Granulating Rolls.
1—Set 36x16″ Sturtevant Balanced Rolls.

If you don't see what you require—inquire

UNITED UTILITIES, Inc.
17 W. 60th Street New York City

FOR SALE



75-ton, 21x26 in. American Locomotive Co. 6-Wheel Switcher, BUILT DECEMBER, 1922; piston valve; Walschaert valve gear; Alco power reverse; superheated; tractive power about 36,000 lbs.; steel wheel centers; steel running boards; steel cab; steel tender frame; electric headlights both ends; flexible staybolts. Complies all I. C. C. requirements, etc. READY IMMEDIATE SHIPMENT.
17—16-yd. WESTERN, heavy duty, steel beam type, 2-way dump cars. Some air, some hand dump. Rebuilt with entire new bodies, steel lined floors.
10—20-yd. WESTERN, all steel, two-way air dump cars; vertical air cylinders.
1—50-B Bucyrus Steam Shovel on caterpillars.

HAVE OTHER EQUIPMENT OVERHAULED AND READY
SOUTHERN IRON & EQUIPMENT CO. *(Est. 1889)* ATLANTA, GA.

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

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USED EQUIPMENT

BARGAINS—Shipment from St. Louis

STORAGE BINS

1—2000 tons cap. (level full) Steel Storage Bin, 32 ft. wide, 24 ft. high, 52 ft. long, of steel plate and I-beam construction, match marked and erection drawings furnished. For sand, gravel, rock, cement, etc. Price $30.00 net ton, f.o.b. St. Louis.
1—265 ton cap. Steel Storage Bin, 10 ft. high, 12 ft. wide, 65 ft. long, with full length continuous hopper, dump valves, steel supporting structure with clearance for cars or trucks. Match marked and drawings furnished for erecting. Price $35 net ton, f.o.b. St. Louis.
2—10 ft. and two 15 ft. diam., 25 ft. high Steel Storage Tanks with slides or dumping holes. Price $175 each for 10 ft., and $290 each for 15 ft.
9—1⅜ ton Hopper Bottom Steel Storage Tanks or Bins.
2—3600 lb. Poidometers (automatic scales) with bins, etc.
2—Steel cased inclined elevators, with 20 in. buckets.

BALL MILLS

9—No. 8 Krupp Ball Mills, 4 ft. 6 in. wide, 8 ft. diam., high capacity for agricultural limestone, preliminary grinding, etc. Parts furnished by American manufacturers. All good.

SHOVEL

1½ yd. 35B Bucyrus Steam Caterpillar. Excellent.

DUMP CARS

30—4 yd. 36 in. gauge Western steel beam.
30—1½ yd. 24 in. gauge Western Wood Beam.
3—7 ton 24 in. gauge Whitcomb Gasoline Locomotives, like new.

Hyman-Michaels Company
Peoples Gas Bldg., Chicago
Railway Exchange Bldg., St. Louis

FOR SALE

24"x36" P. & M. Jaw Crusher.
200 tons 60 lb. Relaying Rails.
1—2"x6" Laboratory Jaw Crusher.
1—Set 36"x30" Smooth Rolls.
1—Set 18"x24" Spike Rolls.
2—10' Morgan Gas Producers.
2—8'x6' Ball Mills.
3—No. 5 McCully Gyratory Crushers.
1—No. 7½ Kennedy Gyratory Crusher.
10—8'x125' Rotary Kilns.
1—9'x100' Rotary Kiln.
1—7½'x80' Rotary Kiln.
10—5'x50' Rotary Coolers or Dryers.

Equipment Sales Company
Richmond, Virginia, and
Benson Mines, N. Y.

FOR SALE

Complete gravel dredging plant with the following equipment, built in March, 1926:—Dredge Boat, 36' long x 18' wide; two pontoons, 8' x 16' supporting 10" Swintek Cutter with 10 HP motor; one 8" late type AMSCO Pump belted to 150 HP slip ring motor with drum controller and resistance; one 3 drum Thomas extra heavy duty motor driven hoist; one high pressure priming and bilge pump, motor driven. All motors 3 phase, 60 cycle, 220 or 440 volts. 600 ft. 8" discharge pipe with flexible couplings and Knox clamps. Pump and equipment in first class operating condition. Will demonstrate at any time. Price $10,000 for immediate sale.

The East End Sand and Gravel Co.
Chillicothe, Ohio

FOR SALE

One Mead-Morrison two yard Dragline Hoist, 100 HP, Lincoln motor, 3-phase, 60-cycle, 220 volts. Used in the production of only 200,000 tons of material.

SCULLY SAND AND GRAVEL CO.
118 First Street Cambridge, Mass.

CRANES

1—40-ton, 8-wheel AMERICAN, Locomotive Crane, New April, 1927, 70 & 80 ft. boom, Bucket operating, Perfect Condition;
1—12-ton cap. NORTHWEST, Model No. 105, GASOLINE Caterpillar Crane, New Aug., 1926, 40 ft. Boom, Like new;

CRAWLER SHOVELS

4—MARION 21, STEAM, New 1926, ¾-yd. HIGH LIFT, 2 have 40 ft. Crane Boom Attachments, Low prices;
1—KOEHRING, GASOLINE, New 1926, 1-yd., HIGH LIFT, Overhauled, Like new;

DUMP CARS

30-yd., 20-yd., 16-yd., 12-yd. & 6-yd., Std. Gauge, STEEL, HEAVY DUTY, two-way side AIR and HAND Dump Cars, New 1926 & 1927.

GREY STEEL PRODUCTS COMPANY
111 Broadway, New York, N. Y.

CRUSHING ROLLS

1—54x24 in. Allis-Chalmers, nearly new, Manganese Shells. In A-1 condition.

The Standard Slag Company
Youngstown, Ohio

Rebuilt Dump Cars

20-yard, all steel, Western air dumps. Ten of these.
12-yard, steel underframe, hand dumps. Seven of these.
6-yard, steel underframe, hand dumps. Seven of these.

Rebuilt Locomotives

55-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam, built 1913.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam, built 1917.
72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Four duplicates.
42-ton American 4-wheel saddle tank, 180 lb. steam, built 1910.
31-ton Baldwin 4-wheel saddle-tank, built 1914.
21-ton Porter 4-wheel saddle tank, 165 lb. steam, built 1912, 36-in. gauge.

Rebuilt Locomotive Cranes

20-ton Link-Belt 8-wheel 2-line, built 1916.
20-ton Industrial 8-wheel, 2-line, built 1917.
22½-ton Ohio 8-wheel, 2-line, built 1915.

Birmingham Rail & Locomotive Company
Birmingham, Alabama

JAW CRUSHERS

1—30x36.
1—18x36.
1—15x24.
1—10x20.

GYRATORY CRUSHERS

1—No. 5 Austin.
2—No. 6 McCully & Gates.
2—No. 5 McCully & Austin.
1—No. 13 Telsmith.
1—No. 7½ Austin.
1—No. 9K Gates.

SYMONS DISC

1—24" Rebuilt.

HAMMER MILL

1—No. 12 Universal.

CLAM SHELL BUCKET

1—Blaw-Knox 2 yd. cap. Class 620-W, Dreadnought. Used 2 weeks.

A. J. O'NEILL COMPANY
406 Weightman Bldg. Philadelphia, Pa.

FOR SALE

1—4'x26' Cummer Dryer.
1—5'x50' Bonnot Dryer.
2—36" Bonnot Pulverizers.
1—5'x4' Allis-Chalmers Ball Mill.
2—50-ton Coal Hoppers.
Bucket Elevators and Screw Conveyors.

J. S. LEWIS, Jonesville, Mich.

FOR SALE

Externally fired rotary dryer, 5"x50', with exhaust fan; used only a short time and in good condition. Can be bought for half price. Address

Box 97, care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Caterpillar Tractors

We offer for sale five brand-new, never used, 5-ton, 55 H.P.

Bear Caterpillar Tractors

There are none better as we have demonstrated on our own work. This is a bargain for new equipment.

ANNVILLE STONE COMPANY
Eighth and Willow Sts. Lebanon, Pa.

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

Want to Sell Any Used Equipment?

We receive hundreds of inquiries from our 6,000 Sand, Gravel and Stone Producers, 30,000 Contractors, and 1,500 Concrete Product Plants, who buy their used equipment through our services.

Want to Buy Any Used Equipment?

We have every kind of well conditioned used equipment, located in every part of this country and Canada, and are saving our listed members thousands of dollars yearly on their purchases.

Want to Rent, Lease or Trade Any Equipment?

We have many inquiries from those who want to rent, trade and lease their equipment, and vice versa.
We will appreciate your inquiries.
Special: Two Complete Duntile Plants for sale at a bargain.

NATIONAL EQUIPMENT CO.
At Terms to Suit Purchaser
P. O. Box H. 232 Bloomington, Indiana

RAILS New and Relay
ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES
S. W. LINDHEIMER
38 S. Dearborn St. Chicago, Ill.

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2919

FOR SALE

Two Bay City locomotive cranes, 8 wheels; one O. & S. locomotive crane, 8 wheels; two switching locomotives.

ACME OIL CORPORATION
189 North Clark Street Chicago, Illinois

FOR SALE

100 H.P. Thomas 2-drum electric hoist, 1½ yd. Sauerman Bucket, 1½ yd. Pioneer Bucket, Insley Steel Mast, Blocks, Guys, etc., for complete Cableway outfit. Used little over one year. Located at Chillicothe, Ill. For sale at a very reasonable price.

COOGAN GRAVEL CO., Inc., Peoria, Ill.

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg. New York City **M. K. FRANK** Union Trust Bldg. Pittsburgh, Pa.

USED EQUIPMENT WANTED

WANTED

One double drum hoist may be attachable to a Fordson tractor, also either a 9 or 13 cu. ft. bottomless scraper. Give price and description.

ILION SAND & GRAVEL CO.
Ilion, N. Y.

Wanted—Tile Machine

Will purchase used hand Spanish roof tile machine if priced reasonable.

JOHN H. ODENBACH
544 Lincoln Alliance Bank Bldg.
Rochester, N. Y.

WANTED

To purchase No. 9 straight drive Gates or McCully used crusher.

MID-WEST CRUSHED STONE CO.
514 Traction Terminal Bldg.
Indianapolis, Indiana

Used Equipment Wanted

If in need of good used equipment make your wants known here and see how quickly you can fill them at reasonable cost.

BUSINESS OPPORTUNITIES

WANTED

To buy or lease on royalty basis. Crushing operation of approximately 1000-ton capacity. Must have good track and good market location. Address

Box 101, care of Rock Products
542 South Dearborn Street, Chicago, Ill.

SITUATIONS WANTED

CEMENT PLANT MANAGER—HAVING EXcellent record, desires to make new connection. Thoroughly experienced in all cement problems, especially cost reduction through chemical control, efficient grinding, quarrying, burning, and building up of morale. Familiar with all phases of closed and open circuit grinding, oil, coal and gas for burning and capable through past experience to supervise either preliminary surveys or construction work. Will consider plant managership or position leading to equivalent capacity after ability is proven. Can furnish record clear beyond doubt. Thirteen years experience, age 33 and married. Address Box 2244, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

AVAILABLE, YOUNG MAN WITH BROAD experience as production clerk and assistant superintendent wishes to make permanent connection with company that will recognize executive ability in the handling of plant shipments, payrolls, operating costs, books and correspondence. Familiar with all phases of crushed stone industry. An adaptable and energetic hustler that can assure efficient results. Address Box 96, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

SITUATIONS WANTED

PACIFIC COAST SALES ENGINEER AND district manager wishes to affiliate with a live organization supplying machinery or equipment to cement, plaster, lime and grinding plants, having held a position as Pacific Coast Manager with a well known organization in Chicago for seven years. Desires to make change. Is in personal touch with all the operators and executives in this territory from El Paso, Texas, to Edmonton, Canada, including Denver. Thoroughly familiar with all plant operations. Address Box 2271, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

PLANT MANAGER OR SUPERINTENDENT —Technical graduate, ten years' practical experience in management of mines, quarries, crushing and grinding plants both in East and far West; capable, resourceful and with excellent references as to ability and character, wishes to connect with large concern offering opportunity for permanency and advancement or with new company just entering the business. Can design, build and operate plants efficiently. Now employed. Can report in thirty days. Address Box 2267, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

WANTED—POSITION AS CHIEF CHEMIST of progressive portland cement company by technical trained man who thoroughly understands the various phases of manufacture, both chemical and mechanical. Can furnish reference of unquestionable reputation and arrange for interview. Wet process preferred. Location of no issue. Would consider an out of the States proposition. Address Box 2270, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

WANTED—POSITION AS CHIEF CHEMist in cement plant. Have had broad experience in the cement industry with 18 years actual operation. Thorough knowledge of quarry and mill supervision, burning with oil or coal, wet or dry process. Age 37 and married. Can furnish complete record with best of reference. Address Box 100, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

SALES ENGINEER WITH LONG EXPERIence with stone crushing machinery is open for engagement. Would prefer interest in quarry operation, preferably in silica sand mill or where fine grinding is required. If you have a mill that is not operating profitably, write me. I can make it pay. Address Box 2280, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

SUPERINTENDENT — DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

POSITION WANTED—CRUSHING PLANT Superintendent. Experienced young man who has handled the office end and for the past six years been operating and production superintendent. Good record and best of references. Address Box 98, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

SITUATIONS VACANT

DRAFTSMAN WANTED, WITH REFERence, and cement plant experience. Address Box 83, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

MANUFACTURER OF COMPOSITION, ALSO cast stone fireplaces, desires man with large experience in both wet and dry process. Wonderful opportunity for a man who has the following qualifications: An organizer; able to handle men, practical knowledge of the reaction of chemicals; carry out experiments, work up own designs and supervise modeling. In fact, handle this Department of a growing concern. Must be able to furnish best of references. Address Box 102, care of Rock Products, 542 So. Dearborn St., Chicago.

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